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Report to the Chairman
Special Committee on Aging
United States Senate

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# POST-HOSPITAL CARE

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## Efforts to Evaluate Medicare Prospective Payment Effects Are Insufficient

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GAO

**United States**
**General Accounting Office**
**Washington, D.C. 20548**

**Program Evaluation and**
**Methodology Division**

B-217732

June 2, 1986

The Honorable John Heinz
Chairman, Special Committee on Aging
United States Senate

Dear Mr. Chairman:

This report summarizes GAO's findings regarding the adequacy of the Department of Health and Human Services' efforts to evaluate the effects of the Medicare Prospective Payment System for hospital care on post-hospital services. As you requested, and as subsequently agreed with your office, we have developed an evaluation plan for determining the effects of Medicare's Prospective Payment System on post-hospital subacute services. We also examined the efforts of the Department of Health and Human Services to evaluate the key issues identified in our study. Our basic findings were presented in testimony on November 12, 1985, before your Committee.

In this report, we have made recommendations to the Department of Health and Human Services that should enhance its efforts to evaluate the effects of the Prospective Payment System on post-hospital care. In addition, this report contains a matter for congressional consideration concerning the need for more extensive and costly studies of the effects of the Prospective Payment System on Medicare beneficiaries and services. We obtained official comments from the Department of Health and Human Services. (See appendix VII.) The Department's comments and our response are presented in chapter 6.

As arranged with your office, unless you publicly announce its contents earlier, no further distribution of this report will be made until 30 days from the date of the report. At that time we will send copies to the Department of Health and Human Services and other interested parties and make copies available to others upon request.

Sincerely yours,

Eleanor Chelimsky
Director

# Executive Summary

## Purpose

The Medicare Prospective Payment System, authorized in 1983, was intended to control inpatient hospital reimbursements ($39 billion in 1984), the largest component of Medicare spending. The System, which is based on fixed per-case payment for diagnosis-related groups, provides hospitals with strong incentives to contain their costs by controlling the amount of services provided or limiting patients' length of stay or both. One way to do this is to substitute skilled nursing facility and home health agency services for hospital care.

This report complements GAO's previous report on the potential effects of the Prospective Payment System on post-hospital services (GAO/PEMD-85-8) and completes GAO's response to a request from the Senate Special Committee on Aging. The report presents an evaluation plan that could be used to determine the effects of the System on post-hospital services and examines the adequacy of the efforts of the Department of Health and Human Services (HHS) to develop this information.

## Background

GAO previously identified several concerns about potential effects of the Prospective Payment System on the magnitude of need for post-hospital subacute care, on patients' access to care, on the quality of this care, and on its costs. Although the Prospective Payment Assessment Commission has some responsibility for monitoring and evaluating the Prospective Payment System, the primary responsibility rests with HHS's Health Care Financing Administration which administers the Medicare program. Under the provisions of the Prospective Payment System legislation, the Administration is responsible for preparing a series of annual reports to the Congress on the effects of the System on hospitals, beneficiaries, and other health care providers, including skilled nursing facilities and home health agencies. (See pp. 10 to 11.)

In order to evaluate the successes and/or failures of Prospective Payment, studies must be conducted that can validly determine whether generalized changes in post-hospital care have occurred and if such changes are attributable to the Prospective Payment System. Otherwise, it may be improperly blamed for problems with which it had little to do, or credited with improvements for which it was not responsible.

## Results in Brief

HHS has numerous studies related to Prospective Payment underway but these will produce only limited information on changes in a variety of outcomes, primarily use of and expenditures for Medicare-covered post-hospital services. HHS has not demonstrated — and does not plan to produce information that can validly demonstrate — whether the changes it does measure are due to the Prospective Payment System, and what effects, if any, the System had on Medicare beneficiaries and/or post-hospital services. (See pp. 48 to 69.)

GAO's analysis of methods for validly attributing observed changes to the Prospective Payment System found that credible evaluations, while difficult, are feasible. A two-part evaluation plan is presented involving different approaches to producing information on the effects of the System on post-hospital services. (See pp. 30 to 46.)

## GAO's Analysis

GAO translates the concerns raised in an earlier report into evaluation questions about the effects of the Prospective Payment System in five areas: (1) patient condition at hospital discharge; (2) the use of post-hospital subacute services; (3) expenditures for those services; (4) access to those services; and (5) the quality of care delivered in those services.

### What Studies Are Possible

GAO's two-part plan for evaluating the effects of the system on post-hospital care draws on two distinct design stategies. First, data available in the Medicare Statistical System are sufficient for causal analyses using an interrupted time-series design. This is based on the analysis of trends before and after an event — in this case monthly aggregates of Medicare bill records before and after the implementation of Prospective Payment. The design, which can be executed using several different statistical techniques, can be used to determine whether changes in the use of and expenditures for Medicare-covered post-hospital services as well as readmissions and mortality are due to the Prospective Payment System. Completion of an on-going project to reorganize Medicare data, the Medicare Automated Data Retrieval System, would constitute the first step in generating data for these analyses. GAO estimates that the cost of conducting these time series analyses is relatively low (approximately $280,000). This estimate includes the cost of completing work on the automated system. (See pp. 39 to 41.) The work could be completed in about one year if the data files were completed on a priority basis.

Second, a design termed the retrospective nonequivalent control group design, using data compiled from medical and other provider records from several points in time before and after the implementation of the

Prospective Payment System, could be used to examine the other outcomes. This approach could produce information on the effects of the System on patients' condition at the time of hospital discharge and better information on the quality of post-hospital care than could be obtained from Medicare data alone on readmissions and mortality. It may also be possible to develop some information on access to post-hospital care. However, additional measurement development would be needed and even when such measures have been developed, the types of studies which will be required to make valid attributions of changes to the Prospective Payment System that are generalizable nationwide will be difficult and costly. While GAO estimates that the direct costs of this type of study could range from $700,000 to $10 million depending on the specific design options selected, GAO's suggested design would cost approximately $3.1 million. (See pp. 42 to 43.) Such a cost is comparable to that of other important studies conducted by HHS.

## What Studies Is HHS Doing?

On the basis of GAO's examination of the ongoing and planned work at HHS, GAO found that, overall, HHS's analyses will not determine whether any observed changes in any of the five outcomes were caused by the Prospective Payment System. As a result, HHS will have no adequate basis for concluding that the System does or does not affect post-hospital care. However, the planned HHS analyses should provide information on the major changes nationwide from before Prospective Payment to after the implementation of the System in the cost and use of skilled nursing home and home health services, and, to a very limited extent, the quality of post-hospital services. Little information will be produced on patients' condition at the time of hospital discharge or access to post-hospital care. HHS is, however, engaged in efforts to develop measures of quality and patient condition which will rely either on data available in the Medicare Statistical System or in medical records. The development of these measures is a prerequisite for conducting national evaluations of those outcomes. (See pp. 48 to 69.)

## Recommendations

GAO recommends that HHS undertake interrupted time-series or equivalent studies using data from the Medicare Statistical System to determine some of the effects of Prospective Payment on post-hospital care. In particular, information can and should be developed about the effects of Prospective Payment on the use of and expenditures for post-hospital skilled nursing home and home health care services, and on readmissions to Medicare-covered facilities and mortality rates for episodes of illness beginning with a hospitalization. (See p. 70.)

GAO further recommends that HHS expedite the completion of the Medicare Automated Data Retrieval System which will reorganize the Medicare administrative data into a data file better able to support research and evaluation than are the current files. (See p. 71.)

## Matter for Congressional Consideration

The Congress has indicated its interest in information on the effects of the Prospective Payment System on the quality of and access to both hospital and post-hospital care. More comprehensive causal analyses of those issues are possible, but they are complicated and more costly than the work covered by GAO's recommendations. Additional measurement development and extensive data collection would be required. If the Congress deems the value of such causal studies of sufficient importance given other priorities, it should ensure, in its consideration of the HHS research agenda and budget that adequate resources are available to carry out the work in a methodologically sound fashion. (See p. 72.)

## Agency Comments

HHS believes that by focusing on only post-hospital care, GAO presents an unfair picture of HHS's overall program of Prospective Payment System evaluations. Second, HHS describes plans for a new study of post-hospital care that they believe will address many of the substantive issues raised in the report. Third, HHS argues that the report fails to consider adequately the difficulties involved in designing attributive studies. Finally, HHS states that while work on the Medicare Automated Data Retrieval System file is progressing, it cannot be the only source of data for studies of the Prospective Payment System.

First, GAO recognizes the complexity of the evaluation task facing HHS, but believes that the scope of the report, which was specifically limited by the congressional request, is adequately stated. Second, GAO is encouraged that HHS has plans to study post-hospital care issues. Indeed, several components of their study are discussed in the report (see p. 63). However, since HHS can provide no written plans for the new study, GAO cannot assess its adequacy. Third, the problems associated with studies designed to provide attributive information are detailed throughout the report. Finally, setbacks in the production of the Medicare Automated Data Retrieval System file have been reported. Unless efforts are specifically directed to the task of correcting these setbacks, it now seems that this new file (which GAO recommends for use in some, but not all analyses) will be completed in a form that cannot support the type of studies which provide information on the effects of Prospective Payment.

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## Abbreviations

| | |
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| ASPE | Assistant Secretary for Planning and Evaluation, HHS |
| BQC | Bureau of Quality Control, HCFA |
| DRG | Diagnosis-Related Group |
| HCFA | Health Care Financing Administration |
| HHS | Department of Health and Human Services |
| ICF | Intermediate Care Facility (nursing home) |
| MADRS | Medicare Automated Data Retrieval System |
| MMACS | Medicare/Medicaid Automated Certification System |
| ORD | Office of Research and Demonstrations, HCFA |
| PPS | Medicare's Prospective Payment System based on DRGs |
| PRO | Utilization and Quality Control Peer Review Organization |
| SNF | Skilled Nursing Facility (nursing home) |
| TEFRA | Tax Equity and Fiscal Responsibility Act of 1982 |

## Chapter 1

# Introduction

The fundamental restructuring of the Medicare hospital payment system begun in 1982 by the Tax Equity and Fiscal Responsibility Act (TEFRA) (Public Law 97-248) and continued by the Social Security Act Amendments of 1983 (Public Law 98-21) was designed to control Medicare costs by changing hospital incentives related to the provision of patient care. The prospective payment system (PPS), which became operational during fiscal year 1984, sets predetermined fixed payment rates for each case based on the diagnosis-related group (DRG) into which it falls.

PPS provides hospitals with incentives to limit costs incurred for each Medicare patient admission. One way to reduce inpatient hospital costs is to shorten patients' length of stay and to substitute non-hosittal services for inpatient care. These services include those provided in long-term care settings covered by Medicare (e.g., home health, skilled nursing facilities, and hospice). Thus, the introduction of Medicare PPS could have substantial effects on the cost, use, and quality of subacute care services in the United States and on millions of elderly. In 1982, for example, 26.5 million persons aged 65 or older were enrolled in the Medicare program, 17 million received some type of covered service, including 244,000 receiving skilled nursing home services and 1,091,000 using home health services.

Since the introduction of PPS, average lengths of stay in hospitals have decreased markedly for Medicare beneficiaries.[1] To the extent that this decrease in length of stay represents a reduction in unnecessary acute care and the appropriate substitution of subacute care, one objective of the PPS reform is being met. However, many representatives of the health care industry and advocates for the Medicare beneficiary population have expressed concerns about PPS, including the fear that some patients are being discharged prematurely while still in need of hospital care. Furthermore, the availability and quality of post-hospital services for patients who would benefit from them has been questioned.

Currently little information is publicly available about the effects of PPS on post-hospital subacute care. The PPS legislation requires the Department of Health and Human Services (HHS) to study and report to the Congress on the effects of PPS on beneficiaries and other payers, inpatient hospital services, and other providers (including nursing homes and home health agencies). Such information is needed to determine whether PPS is working and to guide decisions on changes in Medicare's payment system.

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[1] Department of Health and Human Services, Report to Congress: The Impact of the Medicare Prospective Payment System, 1984 Annual Report (Washington, D.C.: November 1985), p. 6-13.

To develop information for each of these purposes, studies need to be designed so that benefits and problems are detected and PPS is neither blamed unfairly for problems resulting from other factors nor credited for improvements to which it actually contributed little. This report assesses the program of evaluations and studies that HHS has undertaken to determine the effects of PPS on post-hospital subacute services and proposes a two-part evaluation plan for addressing the particular concerns which have been raised about the effects of PPS on post-hospital services.

## Study Background

In a letter dated July 1, 1984, the Chairman of the Senate Special Committee on Aging expressed his interest in a study we were conducting to assess the efforts of HHS to determine the likely effects of PPS on post-hospital long-term care (see appendix I). Specifically, the Chairman asked us to

- identify the range of issues regarding the likely impact of PPS on Medicare skilled nursing facility (SNF) and home health care services, as well as on other long-term care services;
- develop criteria to determine which of these issues are most important for federal evaluation efforts and apply these criteria to the range of issues to select a set of "priority" concerns;
- determine what data and information are and are not available to address these priority concerns and propose an evaluation plan to be used with specific data adequate to monitor and analyze these issues, and
- compare these plan specifications with the evaluation plan and data collection HHS intends to carry out, in order to determine how well HHS' evaluation effort will answer the priority concerns.

Subsequently, we were asked to provide a preliminary report on our study, which we did in a letter report to the Special Committee on Aging (GAO/PEMD-85-8), issued on February 21, 1985. In that report, based on our review of available information and the expertise of individuals having first-hand experience with hospital prospective payment systems, we completed the first two tasks requested by the Committee, identifying four key issues related to the post-hospital care of Medicare patients:

1. Have patients' post-hospital care needs changed?

2. How are patients' needs being met?

3. Are patients having access problems?

4. How have long-term care costs been affected?

In addition to these issues, we indicated that questions were being raised within the long-term care community about whether Medicare was adequately apprising beneficiaries of the changes brought on by PPS and whether Medicare was appropriately administering coverage determinations.

This completed the first phase of our study, and no additional material relating to the identification of issues is presented here. Rather, in this report, we address the third and fourth tasks in the Committee's request by reviewing the information that the Congress can expect to obtain from HHS on the key issues. We examine the extent to which the four questions listed above are answerable, and whether work being conducted by HHS will provide useful answers needed for congressional oversight. Specifically, we translate these general issues into evaluation questions, propose alternative approaches to producing valid and reliable answers to these questions, and compare these designs to work being conducted by HHS.

## Objectives, Scope, and Methodology

The main objective of this report is to assess the adequacy of the information that HHS has or plans to collect on the key issues identified in our February, 1985 report concerning the relationship of Medicare PPS to post-hospital subacute care services funded by Medicare and other sources.

We judge adequacy in terms of the substantive scope of topics on which information is collected, the accuracy of the data relied on, the properties of any measures used, the methodological rigor of analyses conducted, the appropriateness of interpretations drawn from those data and analyses where completed, and the timeliness with which findings are made available. In order to set a standard on which to determine the adequacy of the work of HHS on these dimensions, we developed a methodological framework relevant to the design and execution of studies specifically aimed at the relation of PPS to post-hospital subacute care. We used this framework to identify feasible alternatives to the approach that HHS has adopted to address these questions —alternatives which can provide, at reasonable cost, important attributive information that the Congress has requested.

The substantive scope of interest for this report was determined by the issues identified in the February, 1985 report. What we have done here is to translate those four general issues into five evaluation questions that specify more clearly the types of outcomes relevant to post-hospital subacute care which might be affected by PPS. Those outcomes are: (1) patient condition at the time of hospital discharge, (2) patient use of post-hospital subacute care services, (3) expenditures for those services, (4) patient access to those services, and (5) service quality. In this report, we focus on skilled nursing facilities (SNFS) and home health care. Hospice care is not examined since such services were largely unavailable through Medicare in the period before PPS came into effect, and because the goal of hospice services is different from these other services. Hospices are meant to provide terminally ill patients with care enabling them to die with dignity and as free from pain as possible, while skilled nursing home and home health care are meant to provide medical and rehabilitative services to improve or maintain patients' ability to function.

We distinguish among three general types of information that could be collected on the five outcomes of interest. The first addresses questions about what is happening now. That is, it is descriptive of where program beneficiaries or providers fall on a certain dimension, such as use of home health care, at present or since PPS was implemented. The second type of information focuses on change over time. By comparing relative levels on a measure of interest before and after an event (in this case the introduction of PPS), changes over time can be identified. The third kind of information is attributive. It requires showing the extent to which changes over time can be attributed to or are caused by the new payment system.

Attributive information differs from change-over-time information which merely identifies changes over time without determining their cause. For example, home health care days may be higher now than before PPS because there are more frail elderly in the eligible population who need more care rather than because of PPS. The third kind of information can show whether PPS caused a change, or whether it accelerated or had no effect on trends already underway. This is important if we are to avoid (1) inaccurately blaming or crediting PPS for changes, and (2) basing new policy or practice on misinformation.

In accordance with the concerns expressed to us by the Senate Special Committee on Aging, this report centers on the study designs, measures and data that would be required to produce information on the effects of PPS on post-hospital subacute care. Such information should provide the Congress with a more useful basis for any future changes in Medicare's payment system than would result from descriptive or change-over-time studies. Nonetheless, in assessing the work that HHS has done or plans to do, we considered the full range of studies relevant to the relationship of PPS to subacute care services, including those which are descriptive or involve simple change-over-time comparisons in addition to analyses of effects. We then examined the amount and type of information that the simpler studies will provide compared to more complex attributive studies, taking into account the relative difficulty and costs of producing the three types of information.

Our review of the data collection, research, evaluation and demonstration activities at HHS was designed to ensure that we had a thorough knowledge of its on-going and planned work relating to the effects of PPS on post-hospital care. In addition to discussions with HHS staff, we requested specific information from fifteen HHS offices which conduct and oversee data collection or research related to health services, Medicare, or any long-term care programs. This request, sent in October 1984, asked for a description and point of contact for further information on any data collection or research which addressed the topic of the effects of PPS on subacute post-hospital or other long-term care services. The Office of the Assistant Secretary for Planning and Evaluation of HHS coordinated the responses to this request, and provided us with a package of materials describing HHS activities in November, 1984. We also received several direct responses to the request for information. The review of HHS activities relating to the effects of Medicare PPS on long-term care presented in this report was based upon materials obtained through this process as well as additional materials acquired via follow-up contacts which continued through December, 1985.

Our analysis of the design and measurement issues and HHS data sources drew on our own resources and on expert consultants. Extensive reviews of the literature on prospective payment, long-term care, and the measurement of health status and quality of care (long-term care in particular) were conducted and these materials were analyzed in depth. We also kept in contact with both the Office of Technology Assessment (OTA) staff reviewing PPS evaluation issues and the Office of the Assistant Secretary for Planning and Evaluation staff developing PPS/long-term care evaluation plans (see chapter 4).

Our report complements the report issued by OTA in the fall of 1985 that examined approaches for evaluating the effects of PPS on a wide range of outcomes.[2] The OTA report focused primarily on hospital issues such as quality of inpatient care and medical technology. This report concentrates on post-hospital care and on the extent to which it is feasible to address issues related to it, given the complexities of the health services environment, the manner in which PPS was introduced, and the availability of appropriate measures and data.

## Report Organization

In the next two chapters, we develop our basis for reviewing the adequacy of HHS evaluation activities related to post-hospital care. These chapters focus on substantive and methodological issues involved in answering evaluative questions about Medicare PPS and post-hospital long-term care services. In chapter 2, we discuss the mechanisms by which prospective payment for hospital care could be expected to affect post-hospital outcomes and present an overview of the issues related to Medicare-covered post-hospital services and the wider systems of long-term care services which need to be taken into consideration in the design of evaluations of PPS. Chapter 3 summarizes the appropriateness of available designs, measures, and data for addressing the effects of PPS on the five designated post-hospital subacute care outcomes, and presents a two-part plan for evaluating these effects.[3] In chapter 4, we review the attributive, change-over-time and descriptive studies that HHS has done and is planning to do to evaluate post-hospital care outcomes. Finally, in chapter 5, we compare what we believe needs to be done with what HHS is doing or plans to do and present our conclusions and recommendations regarding the evaluation of the effects of PPS on post-hospital subacute care. The Department of Health and Human Services' comments on the report findings and our response to those comments are presented in chapter 6. Appendix VII contains a copy of the agency comments.

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[2] Office of Technology Assessment, Medicare's Prospective Payment System: Strategies for Evaluating Cost, Quality, and Medical Technology (Washington, D.C.: U.S. Government Printing Office, October 1985).

[3] Extensive discussions of specific design options for conducting studies of PPS effects on post-hospital care and overviews of data and measurement issues are presented in appendixes to the report

# Factors To Be Considered in Designing Evaluations of the Effects of PPS on Post-Hospital Care

In designing evaluations of the effects of PPS on subacute services, three types of factors need to be taken into account. First, it is important to consider the types of changes in provider behavior which could lead to changes in post-hospital services. This analysis tells us when and where we should look for effects. Second, the possibility that forces different from PPS could produce effects similar to those of PPS has to be examined. This examination tells us which other factors could have the same effects as PPS, or could mask PPS effects, and would thus have to be ruled out or taken into account by the studies. Finally, process factors, such as the way in which PPS was developed, enacted into law and implemented by HHS, have to be considered in designing evaluations of the effects of PPS.

## Why PPS Could Be Expected to Affect Post-Hospital Care

Some of the expected effects of PPS relate to the change from a cost-based reimbursement system to a prospective payment system. Other potential effects are more directly related to the specific payment method adopted by Medicare (i.e., the use of DRGs as a basis for payments and their application to only inpatient acute care).

### Effects Related to Prospective Payment in General

Prospective payment methods are, in general, designed to reduce the rate of increase in hospital costs by providing incentives to providers to adopt more efficient practices, both in administrative operations and in patient care. For example, hospitals (and the physicians responsible for patient care decisions) could respond to prospective payment incentives by changing management practices, adopting new, lower-cost technologies, or reducing costs for labor or supplies. If the prospective payment system is based on a fixed rate per case, there are additional incentives to limit the costs of caring for each patient by reducing patients' lengths of stay in acute care facilities. One possible outcome of reducing length of stay is that patients on average will be discharged from the hospital at an earlier stage in their recuperation than would have been the case under the old per diem reimbursement system.

These general incentives could affect some hospitals or groups of hospitals more or less forcefully. Some hospitals historically have had longer average lengths of stay and/or higher average costs. If the longer lengths of stay or higher costs are the result of practice patterns in some hospitals which can be changed without compromising quality of care, it is possible that the pressure to change existing patterns will be more intense than at hospitals where low length of stay is the norm. If longer lengths of stay or higher costs are associated with treating more severely ill patients, hospitals will have more difficulty responding by shortening lengths of stay, and other methods of cost control may be more appropriate. For all hospitals on per case prospective payment systems, however, shortening lengths of stay and reducing per case costs offers the possibility of increased net revenues.

## Potential Effects Specifically Related to DRGs

The use of DRGs in Medicare PPS creates specific incentives for hospitals to shorten patients' lengths of stay. In addition, the fact that only inpatient acute services are paid prospectively provides additional incentives to use other services which are not paid for prospectively, including SNF and home health care, wherever possible.[1] Together, these related incentives could affect all five outcomes we are focusing on in this report: changes in the condition of Medicare patients leaving the hospital, in the use and cost of home health and SNF care, and in the quality of care and patients' access to that care.

Some patients may be discharged in an earlier stage of their recoveries from acute illness. Some patients might not have benefited significantly from the extra days of hospital care that, on average, they would have received under the pre-PPS system; these patients probably will not need more post-hospital care under the PPS system. Others will probably have greater need of subacute care upon discharge than they would have had in the pre-PPS environment. As hospitals attempt to shorten lengths of stay, they may take a more active role in arranging for post-hospital care through extensive discharge planning and more patients may be referred to post-hospital care. In other cases, patients discharged with needs for post-hospital care could be more likely to seek out such services on their own after they leave the hospital. Each of these possibilities means that patients who might not have used post-hospital care in the past may now use home health or SNF services during their recovery from acute illnesses.

At the same time, subacute care providers may respond to a perceived rise in the demand for services, or changes in the types of services needed by discharged Medicare patients, by increasing the volume or changing the type of services they provide. If providers do not respond to increases in demand, or to a need for different or more extensive services, the quality of post-hospital care could be compromised.

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[1] The Medicare program is not intended to provide long-term care services although it does make use of services provided in long term care settings. See appendix II for additional background information on the Medicare program.

DRGs encourage hospitals to substitute cost-based services for inpatient hospital care. The incentive to substitute services could be particularly strong if the hospital also provides the service on a cost basis. To illustrate, a DRG payment for a patient spending 10 days in the hospital for a given condition may be $2500. A second patient with the same condition and DRG classification may spend 5 days in the hospital, and then 5 days in a Medicare SNF. The hospital is still paid $2500, and the SNF (which could be either hospital-based or free-standing) receives $350 (5 days at $70 per diem), for a total cost to Medicare of $2,850. It is possible that PPS could increase Medicare's cost for a patient if hospitals substitute SNF or home health care days for days that were historically spent in the hospital. This is because hospitals receive a DRG payment which reflects the costs of lengths of stay that were the norm prior to PPS, but which now may be partially covered by SNF or home health stays that are paid for separately.

Patients with needs for extensive care pose special problems under PPS. Most patients, even under PPS, have not used nursing home or home health services after leaving the hospital. However, evidence from available studies suggests that patients who use post-hospital services are also likely to have longer than average stays for their DRG. For example, an analysis of 1980 Maryland hospital discharge data has shown that about 67 percent of recorded discharges to home health care and about 70 percent of discharges to nursing homes stayed in the hospital longer than the computed average for their DRG.[2] This suggests that the group of patients most likely to need post-hospital services under PPS, and therefore those most affected if supply fails to keep up with demand for post-hospital services (whether generated by PPS or not), are those whose hospital cases tend to be relatively complex and difficult. Moreover, to the extent that hospitals focus their cost cutting and discharge planning efforts on their most expensive patients, who in general are those with longer lengths of stay, this group of patients could experience a greater relative reduction in inpatient days as well.

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[2] Mark R. Meiners and Rosanna M. Coffey, "Hospital DRGs and the Need for Long-Term-Care Services: An Empirical Analysis," presentation at 111th annual meeting of the American Public Health Association, Dallas, Texas, November 1983.

## Alternative Explanations for Changes in Post-Hospital Outcomes

In order to demonstrate that PPS has affected post-hospital outcomes, it is essential to rule out other factors that could simultaneously influence those outcomes. These include the fragmented responsibility for long-term care, socio-economic factors, advances in health technology, local and regional variation in health care practice and utilization, and state and federal health care program provisions and regulations. The effects of these factors can vary, both across types of post-hospital care services (SNF, home health, and hospice) and between those that affect Medicare-covered services directly versus those which have a more general effect on the long-term care system as a whole. Sorting out these variations requires data on trends over time for national samples that allow for extensive examination of local and regional differences.

### Fragmented Responsibility for Long-Term Care

Post-hospital subacute care is generally obtained in settings which are part of a larger long-term care network. Such long-term care facilities provide a spectrum of services on an ongoing basis to elderly individuals whose physical and/or mental condition make the normal activities of daily living difficult. These services range from institutional care involving extensive medical and nursing services such as skilled nursing home care through home health visits by nurses and home health aides to board-and-care home and personal care services. The federal role in these services varies greatly.

The Medicare program is not designed to cover most long-term care needs. Basically, it provides short-term skilled nursing or "rehabilitative" care in SNFs, home health care, and hospice care.[3] Because of this emphasis on rehabilitation, the care needs of elderly persons with chronic conditions or disabilities generally are not covered by Medicare SNF or home health benefits. (See Appendix II for a description of Medicare benefits and their relation to subacute care.)

Medicare's rules and regulations on eligibility and coverage restrict its direct effects to several narrowly defined segments of the long-term care system. Independent of any changes made by PPS, these restrictions will continue to channel post-hospital care in certain directions based on the services the program funds and the conditions set on payment eligibility. In particular, the rules covering who is eligible to use post-hospital services are fairly restrictive. Thus, the specific regulations governing conditions of coverage for Medicare post-hospital benefits strongly influence utilization of these services. Similarly, changes in other program rules, such as an increase in covered days of care for the SNF benefit or imposition of copayments or deductibles for home health benefits, are likely to affect the use of post-hospital care facilities. Evaluations of PPS would need to rule out or take into account the effects of any such changes.

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[3] As noted in chapter 1, because the Medicare hospice program was just beginning to operate when PPS was introduced, it will be practically impossible to obtain baseline/pre-PPS data on hospice services. Because of this, and also because hospice services have remained a very small part of the Medicare program, we will not address hospice benefits to any extent in this report.

The bulk of federal spending on long-term care is through the federal share of the Medicaid program. Medicaid is the major payer for nursing home care in the United States, paying an estimated $10.4 billion for this service in 1984. Other federal funds administered through title XX block grants and the Older Americans Act support community-based services such as meals programs and adult day care. Changes in coverage and benefits for these programs, particularly Medicaid, could have a major effect on the supply of and demand for services that Medicare also finances to a more limited extent. As a result, evaluations of PPS effects on post-hospital services would need to rule out or adjust for any separate effects brought about by changes in these other programs. (See pages 24 to 26 below.)

## Socio-Economic Factors Affect Supply and Demand for Services

One of the most important factors in the growth of demand for these services is the growth of the elderly population, and, in particular, of the oldest age cohorts within the elderly population.[4] Aging is clearly associated with the onset of physical impairments which can often lead to the need for long-term care services.[5] Age has also been strongly associated with the rates of utilization of Medicare-covered subacute services. In 1981, the use rate for Medicare SNF services was 30.3 persons per 1000 Medicare enrollees aged 85 or more, compared to 13.8 persons per 1000 Medicare enrollees aged 75-84, and 3.8 per 1000 for enrollees aged 65-74.[6]

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[4] Kenneth G. Manton and Korbin Liu, "The Future Growth of the Long-Term Care Population: Projections Based on the 1977 National Nursing Home Survey and the 1982 National Long-term Care Survey," presentation at Third National Leadership Conference on Long-Term Care Issues, Washington, D.C., March, 7-9, 1984, p. 1.

[5] William J. Scanlon and Judith Feder, "The Long-term Care Marketplace: An Overview," Healthcare Financial Management, 14:1 (January 1984), 19; Pamela Doty, Korbin Liu, and Joshua Weiner, "An Overview of Long-term Care," Health Care Financing Review, 6:3 (Spring 1985), 69.

[6] Health Care Financing Administration, Annual Medicare Program Statistics: 1981 (Baltimore, Md.: August 1983), p. 27.

Home health services have also been used more by older Medicare enrollees. In 1982, 5.6 percent of Medicare enrollees 85 years old or older had a Medicare-covered home health visit, compared to 5.3 percent of enrollees aged 75-84 and only 2.9 percent of enrollees aged 65-74.[7] Therefore, as the elderly population grows and its average age rises, there is likely to be an increase in the use of subacute services, including post-hospital services funded by Medicare. Similarly, areas which have a greater proportion of elderly persons are likely to have a greater demand for these services. As a result, a post-PPS increase in the use of post-hospital care services might not necessarily be due to PPS.

## Medical Technology Is Changing the Nature of Subacute Care

The advances in medical technology and practice which have played a part in the increasing longevity of the population are also changing the nature of subacute care services. The development of sophisticated equipment and devices which can be monitored by visiting nurses, technicians or family members have made it possible for people who would in the past have needed extended hospital care to be treated at home. New technology could also change the nature of nursing home care, making it easier or less costly for nursing homes to care for post-hospital patients with extensive care needs. The introduction of new technologies, or the development of easier or safer ways of administering medications could therefore increase the use of subacute services independently of any increase in demand directly growing out of PPS incentives. Alternatively, new technologies, by lowering the costs of services or making them easier to perform, could also mask real increases in the need for and use of services triggered by PPS. Unfortunately, it may be very difficult to isolate the effects of particular innovations, because technologies affecting the demand for post-hospital subacute care may be introduced over a considerable period of time, in different parts of the country and under different circumstances.

## Local/Regional Variations in Subacute Care Use and Medical Practice

Throughout the history of the Medicare program, there have been marked regional differences in the use of post-hospital subacute care services. A study of 1976 Medicare episodes of illness showed that the use of home health services was higher in New England and Middle Atlantic states than in other regions of the country, while Medicare SNF benefits were used most frequently in the Pacific states[8] ; data on the use rates for these services continue to show clear regional differences.[9] The analysts working with the 1976 episode of illness data attributed regional variations in the use of SNF and home health services to local practice variations and differences in the availability of services.[10]

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[7] Health Care Financing Administration, unpublished data, 1985.

[8] Karen M. Young and Charles R. Fisher, "Medicare Episodes of Illness: A Study of Hospital, Skilled Nursing Facility and Home Health Agency Care," Health Care Financing Review, Fall 1980, p. 13.

Average length of stay in acute-care hospitals varies considerably across the United States. In the Northeastern and Middle Atlantic states it is considerably higher (three to five days longer) than in Western states, with most Southern states falling between these extremes.[11] Regional differences in length of stay for the Medicare population have persisted even as the average length of stay for all patients has declined throughout the 1970s and into the 1980s.[12] As discussed above, if differences in length of stay are related to styles of medical practice, rather than to medical necessity, it is possible that practice patterns will change in the direction of adopting modes of treatment which produce shorter lengths of stay. To the extent that shortening lengths of stay increases the demand for post-hospital care, variations in historical patterns of length of stay could mean that increases in demand for post-hospital subacute care services might not be uniform across regions.

## State Health Policies May Affect Providers' Responses to PPS

States shape subacute health care systems by overseeing existing facilities and services through licensure and certification systems, by setting reimbursement rates for the Medicaid program and, in some cases, by regulating the supply of services through the Certificate of Need (CON) process. In order to understand how PPS has affected long-term care services, evaluators will have to be aware of the ways in which past and current local, state and regional conditions could affect subacute care providers' incentives and ability to respond to changes in the demand for post-hospital services triggered by PPS.

Almost all states control SNF bed supply through the CON process. Most states regulate the construction of new or expanded health facilities, especially hospitals and nursing homes, by requiring providers to apply first for a "certificate of need". Unless the state health department or planning agency grants a CON, the facility will generally not be eligible for a state license to operate. These state systems vary widely in organization and legislative mandates. Some states have used their CON regulations to limit the building of SNF and intermediate care facilities (ICFs) quite rigorously. Limiting the supply of nursing home beds is one way to control Medicaid expenditures, which, as noted above, support a large proportion of nursing home care. The formulas that states have developed for determining the need for nursing home beds have produced widely different target ratios for beds per 1000 elderly residents. In some states these target ratios are more than double those in other states.[13]

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[9] Health Care Financing Administration, Annual Medicare Program Statistics: 1982 (Baltimore, Md.: December 1984), pp. 27-28.

[10] Young and Fisher, p. 13.

[11] Health Care Financing Administration, Medicare Program Statistics: Selected State Data, 1978-82 (Baltimore, Md.: 1984), p. 22.

[12] Office of Technology Assessment, Variations in Hospital Length of Stay: Their Relationships to Outcomes: Health Technology Case Study 24 (Washington, D.C.: August 1983), p. 24; HCFA, Medicare Program Statistics: Selected State Data 1978-82, p. 28.

Variation in the availability of nursing home beds (and more specifically, beds certified for Medicare SNF payment) is quite large. In 1981, for example, HCFA data showed that the number of nursing home beds certified for participation in either Medicare or Medicaid per 1000 residents aged 65 or older ranged from 10.4 in Arizona to 95.0 in Minnesota, with a national average of 53.[14] The relationship between the supply of nursing home beds and the need for nursing home services is not well understood[15] ,but it seems reasonable to assume that in states with relatively few SNF beds the ability to substitute SNF days for hospital days would be limited.

The level of CON review of home health care is much more varied. Some states have chosen to review all new applications for home health agencies and others review only hospital-based home health agencies. Some review none at all. Both the rate of entry into the home health market and the type of agencies providing care (free-standing versus hospital-based; proprietary versus public or nonprofit) varies widely across the states.[16] State CON policies could also determine whether existing agencies expand to meet any increase in demand for services, or whether new agencies (either free-standing or hospital-based) enter into local health care markets.

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[13] U.S. General Accounting Office, Medicaid and Nursing Home Care: Cost Increases and the Need for Services Are Creating Problems for the States and the Elderly, GAO/IPE-84-1 (Washington, D.C.: October 21, 1983), pp. 78-79.

[14] Health Care Financing Administration, unpublished data, 1984.

[15] GAO, Medicaid and Nursing Home Care, p. 68.

[16] Judith Lavor Williams, Gary Gaumer, and Margot A. Cella, Home Health Services: An Industry in Transition (Washington, D.C.: Abt Associates, May 3, 1984), pp. 14-18.

Increased market competition could also affect the availability and cost of services in an area, and therefore need to be taken into consideration in the evaluation of PPS effects on subacute services. In theory, increased competition could lower costs and increase the willingness of providers to extend their services to previously underserved areas. It is also possible, however, that providers affiliated with hospitals could take advantage of their direct source of referrals and reduce the importance of free-standing agencies in the market, thereby reducing competition.

## Medicare and Medicaid Reimbursement Policies May Affect Providers' Responses to PPS

Variation among the states in reimbursement for both Medicaid nursing home and home health services is striking. In a study which reviewed 1980 data, GAO found that in some states, SNF and ICF rates varied by less than 10 percent (a few dollars a day), while in others the SNF-level Medicaid rates were more than 50 percent higher than ICF rates. Some states were paying more than twice as much as others for SNF-level care.[17] Expenditure rates (and the services covered) for home health services under state Medicaid programs also vary widely.[18]

The influence of these variations in state payment practice on the nursing home industry is quite significant. If state Medicaid reimbursement policies make the operation of skilled-level nursing home beds reasonably attractive, there is a greater possibility that SNF beds will be generally available, both for Medicaid patients and for Medicare patients with skilled nursing needs. If a nursing home's costs exceed the rates paid for Medicaid skilled nursing care, nursing home operators may find Medicare patients relatively more attractive for the fewer beds available. However, if Medicare rates are not sufficient to cover the costs of patients' care, nursing home providers will have little incentive to accept Medicare patients.

State Medicaid rates for ICF beds may also affect both the availability of beds and the relative attractiveness of admitting Medicare SNF patients to nursing homes. If nursing home operators find reimbursement levels for ICF level care adequate, they may not be interested in dealing with short-stay, post-hospital patients, particularly if these patients have extensive care needs.

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[17] GAO, Medicaid and Nursing Home Care, p. 93.

[18] Williams, Gaumer, and Cella, p. 54.

Because Medicare is the major payer for home health services, it is likely that providers' behavior will be most strongly influenced by Medicare coverage and eligibility criteria. If Medicare program regulations and reimbursement levels are viewed as reasonable by providers, participation in the program would be expected to remain at or above current levels. If the program curtails or restricts coverage or reimbursement, however, some home health agencies might increase their efforts to develop private-pay or private third-party payer markets, and reduce their dependence on the Medicare program. To the extent that this redirects available services away from Medicare-covered services, this could cause access problems for some patients. Any significant changes in Medicare coverage and reimbursement policy made after the implementation of PPS would therefore have to be taken into consideration in evaluations.

There have been some changes in the way that providers of nursing home and home health services have been reimbursed under Medicare, including one significant change in reimbursement policy for home health services which was instituted after the implementation of PPS: new reimbursement cost limits became effective for home health providers beginning July 1, 1985. These new regulations limit reimbursement to 120 percent of the mean cost for each of six types of visits for geographic areas. Beginning July 1, 1986, the limits are scheduled to be reduced to 115 percent of the mean, and then to 112 percent of the mean costs beginning July 1, 1987. Research will have to establish whether cost limits affect providers' incentives to participate in the Medicare program, and therefore affect patients' access to care as well as program costs.

State Medicaid policies are likely to have much less effect on home health services than on SNFS, unless state involvement in home health care and community-based long-term care services as a whole takes on greater importance. If state programs designed to increase the availability of community-based home health services expand considerably, then Medicaid policies for home health care for chronically ill persons may begin to shape provider behavior in the same way that Medicaid nursing home policies have.

Interactions between the Medicare and Medicaid programs, the major funding sources for home health and nursing home services, may be important in interpreting changes in these services. An increase in the demand for post-hospital services spurred by Medicare PPS could place additional pressure on nursing homes to use available beds for Medicare

SNF patients. This could, in turn, increase access problems for Medicaid patients. The likelihood of this happening, however, will, in part, be determined by the relative attractiveness of Medicare and Medicaid reimbursement policies. State restrictions on the supply of services, or reimbursement levels, or tightening survey and certification procedures could also affect the availability of Medicare as well as Medicaid services. Nursing home access problems could, theoretically, spill over into the home health area if patients unable to gain access to SNFs are sent home with skilled nursing needs. If patients' home care needs are not covered under the Medicare criteria, their ability to pay for services — either out-of-pocket or through insurance— or their eligibility for Medicaid may become increasingly important. A thorough understanding of the effects of Medicare PPS will therefore require analyses of changes extending beyond the Medicare program to the federal health care programs as a whole.

## Process Factors in the Implementation of PPS

The implementation of the PPS reform has been a complex, gradual process. In effect, the transition from a relatively open-ended cost-based reimbursement system to the current prospective payment system began with the 1982 TEFRA legislation. TEFRA substantially expanded existing cost containment mechanisms and converted them from a per diem to a per-discharge (case-mix adjusted) basis. It thus established incentives for hospitals to cut costs for patient care through reductions both in services and in lengths of stay. These incentives were then considerably reinforced by the implementation of the DRG-based prospective payment system in October 1983. TEFRA continued to have an effect after the implementation of PPS because of a provision of the PPS legislation which specified that total federal payments under PPS in fiscal year 1984-85 were to be "budget-neutral" (i.e., relative to what the federal government would have paid for Medicare with the TEFRA limits in effect).

In addition, the implementation of PPS itself involved a gradual phase-in of complex provisions over several years. Beginning with the passage of the legislation in April 1983, hospitals could have made a number of changes in anticipation of switching over to the PPS system. If this hypothesis is correct, an evaluation design would have to be sensitive to changes occurring prior to the formal implementation of PPS. In addition, the formal implementation of PPS has been staged in two ways. First, hospitals were paid prospectively from the beginning of their Medicare cost-reporting year starting on or after October 1, 1983. Therefore, hospitals across the country gradually came under the system between October 1, 1983 and September 30, 1984. Second, the transition from prospective rates reflecting each hospital's historical costs to uniform DRG rates across hospitals is occurring over a four-year period.[19]

## Summary

A variety of factors must be considered in developing studies for answering questions about the effects of PPS on post-hospital care. First, an examination of the incentives provided by PPS suggests that health care providers may make substantial changes in their behavior that will affect patients' condition at the time of hospital discharge and the use, cost, quality of and access to post-hospital services. Plans for evaluating PPS should therefore include assessment of its effects on these outcomes.

Second, the health services environment into which PPS has been introduced is a dynamic and complicated one. Medicare policies change fairly frequently, as do those of other programs providing related subacute care such as Medicaid. The pool of Medicare beneficiaries is growing larger and becoming more elderly. Advances in medical technology enable a wider range of medical services to be provided in non-hospital settings. Substantial variation in local medical practice, in Medicaid reimbursement rates and in state regulation of health care facilities creates widely differing levels in the supply and use of post-hospital services. These factors either need to be taken into account or ruled out as potential explanations in the design of attributive studies of PPS. In addition, the extent of variation suggests the importance of using large national data bases, and underscores the risks of drawing incorrect conclusions from studies of a few states or localities.

Third, the specific circumstances surrounding the introduction of PPS need to be considered in developing specific evaluation designs. Optimally, the chosen designs would be able to distinguish the effects of the TEFRA cost restraints from both the potential anticipatory effects of PPS as well as the formal implementation effects. However, given the timing of the TEFRA and PPS interventions, it may not be possible, in practice, to separate their independent effects. In addition, the phased nature of both the TEFRA and PPS interventions will probably result in the effects increasing gradually over a period of time and only reaching their full effect after several years. Therefore, evaluation designs which are sensitive to the complex nature of the transition and its gradual implementation over time are required.

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[19] During the PPS phase-in period (fiscal years 1984-1986), the actual payment to a hospital is a blend of the hospital-specific and federal Medicare rates. The hospital-specific portion is based on the hospital's actual reasonable costs per Medicare discharge generally during its fiscal year 1982 cost reporting period. The federal portion is based on the amount calculated using the PPS methodology. In fiscal year 1984 the federal portion was 25 percent, in fiscal year 1985 it was 50 percent, and in fiscal year 1986 the federal portion was to be 75 percent. However, the hospital portion is now scheduled to increase to 55 percent in the eighth month of a hospital's 1986 cost reporting year and implementation of the 100 percent federal portion has been postponed until October 1, 1987.

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Chapter 3

# A Plan for Evaluating the Effects of PPS on Post-Hospital Subacute Care

In this chapter we present support for our conclusion that information on the effects of PPS on post-hospital care can be developed. First, we discuss our findings with regard to measurement, data requirements and design options for studies addressing the concerns of the Senate Special Committee on Aging regarding the effects of PPS on post-hospital subacute services provided in long-term care settings (i.e., home health and nursing home care). Then, in response to the Committee's request, we present a two-part plan for producing credible attributive information. We believe this plan is the most appropriate one available, based on our review of design and methodology options, our knowledge of existing measures and data, and the need to minimize costs and delays while maximizing the conclusiveness of the information to be produced. It is always possible, however, that alternative plans can be developed that are both methodologically sound and address the Committee's concerns.

The first part of the plan outlines evaluations which can be undertaken quickly and inexpensively using existing measures and Medicare program data to answer questions about the use of and expenditures for post-hospital subacute services, and to a more limited extent, the quality of that care. The second part of the plan is an approach for addressing questions about patient condition at hospital discharge and access to post-hospital subacute care and for obtaining additional information on quality of care. It depends on the development of suitable measures and appropriate data from medical records. This plan and its evaluations take into account the three types of factors presented in chapter 2 as important to consider in designing evaluations of the effects of PPS. The likely ranges of costs for the proposed evaluations are also presented.

## Measurement Issues

Before evaluations of any sort can proceed (whether they are descriptive, measure changes over time, or seek to attribute findings to a particular cause, as discussed in chapter 1) measures need to be identified and tested for their appropriateness to a given situation. For example, in assessing patient condition at the time of hospital discharge, measures which had been used to study patient condition at admission to a hospital or after admission to a nursing home might be examined to see if they were appropriate for use in measuring patient condition at hospital discharge. We believe that the most important measurement properties to be established through such testing are reliability, construct validity, and sensitivity. Descriptions of these properties as well as a detailed discussion of available measures and measurement problems related to each of the five outcomes are presented in appendix III.

In this section we state our findings concerning the current availability of measures tested for application to each of these outcomes. In some cases where the suitable measures are not currently available, we look at measures presently used to represent related concepts that could possibly be adapted — with proper testing — to the purposes of our proposed evaluations. The results of this review and analysis are summarized in table 3.1 and discussed in the following sections.

**Table 3.1: An Assessment of the Availability of Measures for Evaluating the Effects of PPS on Post-Hospital Subacute Care Services**

| | Measures with adequate properties | | | |
|---|---|---|---|---|
| **Construct** | **Are available** | **Are available but not tested for this purpose** | **Possible with added development** | **Are not available** |
| Patients' condition at hospital discharge | | | | |
| Physical condition | | X | | |
| Need for post-hospital care | | | X | |
| Functional status | | X | | |
| Use | | | | |
| Number of patients | X | | | |
| Volume of use | X | | | |
| Expenditures | | | | |
| Medicare | X | | | |
| Medicaid | X | | | |
| Other state | X | | | |
| Personal | X | | | |
| Access | | | | |
| Direct measures | | | | X |
| Proxy measures[a] | X | | | |
| Quality of care | | | | |
| Health outcomes | X[b] | | X | |
| Proxy measures[c] | | X | | |

[a] Potential access (supply) and realized access (use)

[b] Readmissions and mortality

[c] Process and structure measures of quality

Briefly, with respect to each of the outcomes, we found that measures for use and expenditures are adequate for evaluations of the effects of PPS. Some measures of patient condition and quality of care are available but will require additional testing and validation before they can be used in evaluations of the effects of PPS. Appropriate measures of access are not currently available (see table 3.1).

## Patient Condition at Discharge

Being able to measure patient condition at the time of discharge is essential for three reasons: to determine whether Medicare patients are receiving adequate hospital care, to assess the appropriateness of discharge decisions, and to anticipate the demand for post-hospital services. We divided the general concept of "patient condition" into three constructs: physical condition (in terms of physiological signs and symptoms); need for skilled care (nursing and/or therapeutic); and ability to perform the activities of daily living (ADLs) — such as feeding, bathing, or being continent — or instrumental activities of daily living (IADLs) — such as cooking, shopping, or using the telephone. These three constructs represent conceptually different aspects of patient condition, and we believe that each merits consideration.

A number of measures have been developed which assess the severity of patients' conditions at various points in their illness and recovery, but we know of no measures which have been developed, tested and shown to be valid and reliable for the purpose of assessing the physical condition of Medicare patients at the point of hospital discharge. Work is, however, proceeding rapidly in this area (see chapter 4). Measures of the need for skilled care following hospitalization are less well developed and would need considerable additional work before they could be used to assess patient condition. In particular, special attention would have to be paid to the interaction between medical definitions of the need for skilled care with the Medicare conditions of coverage for SNF or home health care.

Measures of functional status (ADLs or IADLs) have received considerable attention in the research community, but these measures or scales are primarily targeted to the assessment of the long-term care needs of the frail, chronically ill or impaired elderly, and not the subacute care needs covered by Medicare. As a result, the usefulness of these measures for assessing patients' condition at time of hospital discharge has not been established. Nevertheless, the nature of some of the problems that have been attributed to PPS based on individual experience suggests that problems related to patients' ability to function independently when they leave the hospital are likely to be relevant to patients entering into post-hospital, subacute care.[1]

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[1] General Accounting Office, Information Requirements for Evaluating the Impacts of Medicare Prospective Payment on Post-Hospital Long-Term Care Services: Preliminary Report, GAO/PEMD-85-8 (Washington, D.C.: February 21, 1985).

In sum, we know of no existing measures that have yet been proven valid for assessing the condition of Medicare beneficiaries at the time of hospital discharge with respect to physical condition, need for skilled nursing care, or functional ability. Valid measures might well become available in the near future, particularly for physical condition and functional status, but until they are tested for these specific purposes their utility will remain in doubt.

## Use and Expenditures

Briefly, measuring the use of and expenditures for post-hospital subacute care services does not present any major conceptual problems. Measures of use and dollar amounts spent are straightforward; the problems which hamper evaluators are, for the most part, more likely to arise with respect to the accuracy or availability of data (discussed on pp. 98 to 100) than with the manner of measuring changes.

## Access to Post-Hospital Care

Measuring access to care is a major problem. Using waiting lists for services, complaints to ombudsmen for the elderly, information on problems recorded by discharge planners, etc., could be helpful, but such information is not likely to be available in a consistent form either across sites or for pre-PPS periods. The only direct measure available for the Medicare program is the number of days reported as "alternative placement days", that is, days patients spend in the hospital awaiting placement in a nursing home bed. In the past, utilization review organizations identified only a portion of the alternative placement days presumed to exist, and there is evidence that the determinations made by the organizations varied substantially across hospitals (see appendix III). Under PPS, alternative placement days are only likely to be detected in cases where patients reach the special "outlier" status (entitling them to additional reimbursement) due to the inability to place them in a nursing home bed. Thus using alternative placement days as a measure of access problems is not recommended.

In the health services literature, the concepts of "realized" and "potential" access have sometimes been advanced as proxy measures. Realized access is actual use of services; more use is taken to indicate increased access. Potential access is represented by the supply of services, in this case nursing home beds or nurses employed by home health agencies. While a clear lack of available services might be a reasonable indicator of possible access problems, there are too many factors besides "need" which influence supply and/or use to warrant employing them as proxies for access.

In short, there are no established measures for access to post-hospital subacute care, and no related measures that we have found which could plausibly be adapted to this purpose. Until basic measures for this concept are conceived, refined, and tested, systematic analysis of this issue cannot proceed.

## Quality of Post-Hospital Subacute Care

The three main dimensions of quality of care discussed in the literature are health outcomes, process measures and structural characteristics of health care facilities. Process measures (which focus on the amount and types of services provided) and structural measures (measures of the adequacy of physical plant and equipment, staff and organizational resources) of quality of care are integral parts of the certification process for many providers but the relationship between them and health outcomes has not been established. Global indicators of health care quality outcomes, including deaths and hospital readmissions, are available and could be used for preliminary analyses (see appendix III). However, they convey only limited and sometimes ambiguous information about the quality of post-hospital services.

More direct measures of the quality of care in long-term care settings are currently under development at HHS and elsewhere. However, this work largely focuses on the general long-term care population, and its relevance to post-hospital subacute care is uncertain. Some of the special problems which apply to the measurement of health care outcomes in long-term care facilities where many of the patients are chronically ill or are suffering from progressively serious or terminal conditions would not be important for the post-hospital subacute patient. In general, potential outcome, process, and structural measures of health care quality currently exist and continue to be refined, but their application to post-hospital subacute care needs to be validated through appropriate testing.

# Data Considerations

In developing our evaluation plan, we reviewed the data available in existing national long-term and/or post-hospital care sources which might be used for evaluating the effects of PPS. This included an examination of the completeness and accuracy of their data elements and an assessment of their probable usefulness for attributive studies of PPS. We assessed the usefulness of data collected by Utilization and Quality Control Professional Review Organizations (PROS), the organizations responsible for monitoring Medicare hospital care, as a source of information for evaluating of the effects of PPS on post-hospital care. We also assessed the possible benefits and problems likely to be associated with collecting original data from medical records for analyses of PPS effects. Detailed discussion of these sources is presented in appendix III.

Table 3.2 summarizes our assessment of the availability and quality of existing data relevant to post-hospital outcomes for which suitable measures have been established. Because validated measures specifically designed for measuring patient condition and access to post-hospital care are not currently available, they were not included in the table. As indicated in the table, the limitations of existing data present the fewest difficulties for evaluations of the use of Medicare post-hospital services and of global indicators of quality such as mortality and readmissions to hospitals or nursing homes. Data on Medicare expenditures for post-hospital services present some problems because the amounts recorded on individual patient bills represent interim, rather than final, payments. As far as we can determine, there is no way to reconstruct actual final payments for individual patients. We do not believe, however, that this problem is a major threat to the validity of analyses using these data. Changes in the coverage criteria for Medicare home health services over time will complicate the analyses of Medicare home health use, but the problems of consistency only become serious in comparing data from before 1980 to later data.

**Table 3.2: Adequacy of Existing Data for Evaluating the Effects of PPS on Post-Hospital Outcomes Where Suitable Measures Are Now Available[a]**

| Outcome | Data are known to be accurate and consistent | Data are likely to be adequate but will require verification | Only fragmentary national data are available | No known national data source |
|---|---|---|---|---|
| Use | | | | |
| Medicare | | X | | |
| Medicaid | | | X | |
| Community-based long-term care | | | X | |
| Personal | | | | X |
| Expenditures | | | | |
| Medicare | | X | | |
| Medicaid | | | X | |
| Community-based long-term care | | | X | |
| Personal | | | | X |
| Quality of care | | | | |
| Mortality | | X | | |
| Readmissions | X | | | |
| Structure | | X | | |

[a] Patients' condition at discharge and access are not shown on the table because validated measures (i.e., tested for this purpose) for these outcomes are not currently available.

Data on expenditures for and use of non-Medicare post-hospital services are extremely limited and generally not suitable for causal analyses. To go beyond analyses of quality of care based on readmissions and mortality statistics, and to examine issues of patients' condition at hospital discharge and of access to post-hospital subacute care, more data than those currently collected by the Medicare program will have to be assembled. One promising potential source is medical records, although the feasibility of abstracting reasonably complete and accurate data from those records will have to be assessed for the specific items needed to address particular questions. The cost of producing such data will also depend on the nature and amount of information sought, and the characteristics of the records to be abstracted.

## Design Options

Since changes attributable to PPS constituted a major concern of the Senate Special Commitee on Aging, our analysis focused on attributing changes in post-hospital subacute care to PPS and ruling out alternative explanations for the observed changes. We do not, of course, mean to imply that descriptive information and information about changes over time cannot also prove highly useful to policymakers. Indeed, such information can often be obtained more readily and rapidly than attributive information. However, it falls short of providing the conclusions about the results of an intervention that can best guide new policy efforts. Attributive information should therefore be sought when major changes have been made in public programs. Where available, it not only furnishes more precise guidance for policy decisions, but also, in the process, produces both descriptive and change-over-time information. For these reasons, in our two-part plan we have developed approaches (i.e., designs) to produce attributive information on the five outcomes of interest.

Our primary concern was with the estimation of any national aggregate changes in the five outcomes of interest that resulted from the implementation of Medicare PPS. Such aggregate national estimates would necessarily subsume likely variations among classes of providers and patients. However, we believe that the estimates which could be developed using this approach would represent an important first step in investigating the effects of PPS. Consequently, the evaluations we propose do not directly address such questions as what aspects of PPS caused any observed changes, what other factors explain variation in outcome (except by ruling them out as explanations for observed changes), or how the costs and benefits of PPS are distributed among providers and/or beneficiaries. Many of these issues could be pursued in subsequent analyses through an elaboration of our proposed approaches that focuses on the differential effect of PPS on specified subgroups of providers and patients.[2]

Our analysis of design options included the need to take the specific circumstances surrounding the introduction of PPS (as discussed in chapter 2), as well as the general methodological strengths and weaknesses of alternative designs, into consideration. We concluded that only two general design options, an interrupted time-series design and an augmented nonequivalent control group design, are both feasible and capable of producing reasonably valid conclusions regarding PPS effects on post-hospital subacute care services (see appendix IV for details). In the case of PPS, the fact that the program has already been implemented nationally rules out all forms of prospective experimentation, and some retrospective approaches as well. Only approaches that rely on data already recorded in some form are feasible. In addition, to produce reasonably valid attribution of any observed changes to PPS, a design must provide a way of estimating what would have happened in the absence of PPS and of ruling out alternative explanations for the observed changes.

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[2] By using descriptive information on providers and beneficiaries collected along with the outcome measures, various analyses focusing on the effects of PPS on particular groups of providers (e.g., profit-making versus nonprofit home health agencies) or beneficiaries (e.g., "young" versus "older" elderly) could be conducted.

## The Interrupted Time-Series Design

### Description of the Design

The strongest available design option for evaluating the effects of PPS on post-hospital care is the interrupted time-series design. In this approach, evaluators would use several years of quarterly or monthly pre-PPS and post-PPS Medicare data to develop estimates of the difference between what occurred after the implementation of PPS to what would have happened in the absence of PPS. Several statistical techniques including autoregressive integrated moving average (ARIMA) models and regression are available for developing these estimates (see appendix V). For example, time-series designs could be used to look at the pattern of changes in the use of home health services following hospital discharge for a period of time before the implementation of PPS and compare this to the pattern after implementation. Factors affecting outcomes related to post-hospital subacute services before the implementation of PPS, such as the growth of the elderly population or changes in technology, would be reflected in the pre-PPS trend and therefore taken into account.

In this way, the structure of the time-series design itself rules out many alternative explanations. Only events which both influence the outcomes of interest (or their measurement) and take effect at essentially the same time as PPS pose serious threats as competing explanations for any observed changes in the outcomes that closely follow the implementation of PPS. For example, if the proportion of Medicare patients receiving home health services following hospitalization was calculated for each month beginning January, 1980 and continuing through 1985, and changes in the trend of home health use were detected after the implementation of PPS in October 1983, these changes could reasonably be attributed to PPS unless it was established that something else happened in October 1983 which could have caused a similar change in the use of home health services by Medicare beneficiaries. However, to the extent that the effects of PPS are delayed, result in anticipatory changes, or emerge gradually over time, it will be harder to estimate the specific effect of PPS relative to that of other factors which changed during the same timeframe.

As is discussed in appendix V, the time-series approach can be augmented by analyzing separately groups of hospitals which began PPS reimbursement at different times. This approach turns the complication of staggered entry into the system due to different hospital fiscal years into an analytical bonus. It allows analysts to compare hospitals which began receiving PPS payments at a particular point in time (such as October, 1983) with other hospitals which had not yet begun PPS. This provides an additional control for alternative causal explanations of changes observed following the implementation of PPS.

The general recommendation for using the time-series design is that data for roughly 100 time points — 50 before and 50 after the time of an intervention such as PPS — are needed for the type of statistical analysis typically employed with this design. This approach can only be used for investigating effects for which data of adequate quality exist over a sufficiently long period of time to construct such a series. In the case of PPS, 50 or more pre-PPS observations could be drawn from Medicare files, but 50 post-PPS observations will not be available until 1988 data are ready for analysis. We believe, however, that 25 to 30 post-PPS observations (using monthly data beginning in October, 1983 for hospitals coming under PPS at that time) would be sufficient to demonstrate large effects, although there could be some statistical instability in the estimates. Adding additional observations as they become available will increase the stability of the estimates.

## Using the Design for Evaluations of the Effects of PPS

Data from the Medicare Statistical System could be used with the interrupted time-series design to yield important information about the effects of PPS on Medicare use and expenditures for SNF and home health services. In addition, readmissions and mortality could be used as global indicators of the quality of care. The Medicare Statistical System does not include any data useful for assessing the effects of PPS on the remaining outcomes (see table 3.3).

Table 3.3: Information on the Effects of PPS on Post-Hospital Care That Can Be Obtained From the Medicare Statistical System Using the Interrupted Time-Series Design

| Outcomes | From existing and validated measures | If existing measures are validated | With the development of new or better measures |
|---|---|---|---|
| Patients' condition at discharge | None | None | None |
| Use | Number of users<br>Volume of services | Nothing additional | Nothing additional |
| Expenditures[a] | Expenditures per patient<br>Expenditures per episode of illness | Nothing additional | Nothing additional |
| Access | None | None | None |
| Quality | Readmissions[b]<br>Mortality[b] | Nothing additional | Inappropriate types or amounts of care[c] |

[a] Based on interim bills that may not exactly equal, in sum, the total of Medicare expenditures.

[b] From skilled nursing facilities or home health agencies within specified periods of time.

[c] For example, physician or outpatient clinic visits under Medicare Part B.

Developing the necessary time-series data from the Medicare Statistical System would require extensive reorganization of the data. Currently, the structure of the Medicare data (i.e., utilization or bill records) is based on the order in which bills are processed by HCFA. In order to be used for evaluations such as those discussed here, the data would have to be reorganized into a structure that grouped all services provided to a patient during an episode of illness together. The data would also have to be sorted chronologically by date of hospital discharge.

The Health Care Financing Administration has started to develop such a data file, called the Medicare Automated Data Retrieval System (MADRS). Work on the new data file began in February, 1984, but completion of the key project in this effort has been delayed. Once complete, this file would contain extensive information that could support a wide range of studies examining the effects of PPS on hospital care; on quality of care based on patients' post-hospital use of medical services covered under Medicare part B (see chapter 4); on the use of specific types of home health and nursing home services; and on various types of providers of care and subgroups of Medicare beneficiaries. According to HCFA, the file would substantially reduce the costs of studying patients' combined use of hospital and post-hospital Medicare services.

Most important for consideration here, the Medicare Automated Data Retrieval System could be used to generate time-series data.[3] As discussed in greater detail in appendix V, other approaches for developing time-series data from existing Medicare files are possible. We believe, however, that the extensive information and the capacity to create and manipulate research files makes the Medicare Automated Data Retrieval System the preferred choice for developing time-series data. We therefore view the completion of this data file as the first step in completing the time-series analyses.

### Costs and Time Involved

The costs and time involved in completing the construction of the necessary research files and doing the statistical analyses are likely to be small compared to the costs of collecting new data. We believe that basic time-series analyses of PPS effects on use, expenditures, readmissions and mortality rates could be conducted for about $280,000 in direct costs, including the cost of completing the Medicare Automated Data Retrieval System. If efforts are made to complete the new data file on a priority basis, time-series analyses could be ready in about one year.

## An Augmented Nonequivalent Control Group Design

### Description of the Design

The second part of our evaluation plan could be used to develop attributive information on outcomes that cannot be addressed using Medicare Statistical System data. The augmented nonequivalent control group approach, applied retrospectively, is based on collection of data from medical or other records maintained by providers. It involves comparing changes in outcomes for Medicare patients discharged from hospitals under PPS with those for patients discharged from hospitals coming under PPS at a later time. This is possible because hospitals began operating under PPS at different times, depending on the starting dates of their cost-reporting years. Assuming that the groups of hospitals are generally similar, differences in outcomes could reasonably be attributed to PPS. For example, if patients discharged from hospitals under PPS were generally in less stable condition than patients discharged from hospitals not yet under PPS, as well as less stable than patients discharged from the same hospitals before PPS, then there is reason to believe that PPS caused this difference.

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[3] New problems with the file have developed since this report was sent to HHS for comment. Due to these problems, HCFA now plans to reduce the number of years of data to be included in the The Medicare Automated Data Retrieval System. We believe that such a change would be short-sighted and have a negative effect on HCFA's ability to conduct evaluations.

In general, the basic retrospective nonequivalent control group design provides only weak support for making causal attributions (see appendix IV). However, the augmented version of this design discussed in appendix V represents an adequate alternative for evaluating outcomes that cannot be examined using the time-series approach. The design employs the same type of comparison as the augmented time-series design, that is, between groups of hospitals which came under PPS at different time points. Nevertheless, while the augmented nonequivalent control group design offers clear design advantages over simple pre-post PPS comparisons, it is not without significant limitations. The design is only valid for identifying the effects of the formal, phased implementation of PPS. If the magnitude of change associated with the formal implementation of PPS is small relative to the anticipatory effect, the usefulness of this design approach will be seriously undermined. No comparable approach exists for distinguishing among hospitals by when they first became aware of how PPS would change their incentives under Medicare.

## Using the Design for Evaluating the Effects of PPS

Obtaining the data necessary for evaluations based on the augmented retrospective nonequivalent control group would require the extraction of data from medical and other records maintained by health care providers. The design could be used to produce information on the effects of PPS on patients' condition at time of hospital discharge. It could be used to provide better information on the quality of post-hospital care than can be obtained from Medicare data on readmissions and mortality alone. We also believe it would be possible to generate some information on the use of post-hospital care by patients needing such care— that is, on access to needed post-hospital care— (see table 3.4).

Table 3.4: Information on the Effects of PPS on Post-Hospital Care That Can Be Obtained With Data Abstracted From Medical Records Using the Augmented Nonequivalent Control Group Design

| Outcomes | From existing and validated measures | If existing measures are validated | With the development of new or better measures |
|---|---|---|---|
| Patients' Condition at Discharge | None | Physical condition | Need for post-hospital care |
| Use | Number of users and volume of services for Medicaid | Nothing additional | Nothing additional |
| Expenditures | Expenditures paid by Medicaid[a] | Nothing additional | Nothing additional |
| Access | No | No | Use rates of post-hospital services by patients in need of care[b] |
| Quality | No | For skilled nursing care on rates of recuperation, avoidable complications, appropriate treatment plans | For home health care services on rates of recuperation, avoidable complications, appropriate treatment plans |

[a] Appropriate data on use and expenditures from other sources (e.g., state funds or out-of-pocket) are probably not available.

[b] Assuming that a valid and reliable measure of need for post-hospital care can be developed.

### Costs and Time Involved

Original data collection from several separate samples of patients for a relatively large number of hospitals would involve substantial costs. In particular, the need to have trained abstractors laboriously extract information from medical records adds considerably to the costs of data collection. An evaluation based on an augmented nonequivalent control group study of this sort is described in appendix V. We estimate that it would cost between $700,000 and $10 million, depending on the particular design options chosen. The set of options that we believe would be most appropriate would cost approximately $3 million. The details of the specific design options and estimates of the costs associated with each are presented in appendix V. Like other studies involving original data collection, the augmented nonequivalent control group study described in appendix V would take two to three years to complete.

## A Plan for Evaluating the Effects of PPS on Post-Hospital Subacute Care

The two-part evaluation plan we have developed for determining the effects of PPS on post-hospital subacute care puts priority on using existing data for analyses which can be done quickly and relatively inexpensively. First, we believe that time-series analyses of changes in the use of and expenditures for Medicare post-hospital subacute services using existing Medicare program data should be done. Analyses of readmissions and mortality should also be conducted. The time series analyses would provide highly credible causal inferences about the aggregate effects of prospective payment on those outcomes where sufficient existing data are available to obtain the necessary pre- and post-PPS observations. Second, we would use the results of the time-series analyses in conjunction with other factors (e.g., the availability of evaluation funds and/or decisions about what the most important issues/outcomes to investigate were) to plan primary data collection efforts based on the augmented nonequivalent control group design described in appendix V.

In addition to generating some important information on the effects of PPS on post-hospital care in an efficient manner (both in terms of time and money), a further reason for giving priority to time-series analyses is that they would help to guide decisions about how to proceed with further evaluations of PPS and its effects on health care for the elderly. For example, if the time-series analyses clearly showed that changes in Medicare use and expenditures began with TEFRA and that PPS only continued the changes begun by TEFRA, then conducting evaluations using the retrospective nonequivalent control group design would not be logical. However, if the time-series analyses showed large and consistent increases in readmissions and mortality associated with the formal implementation of PPS, then further investigations of the effects of PPS on quality of care might be warranted, using the augmented nonequivalent control group design. Finally, by showing on which outcomes PPS had the greatest effect, the time-series analyses could help identify areas to emphasize in measurement development and further causal analyses.

We believe that final decisions about whether or not to proceed with attributive studies beyond the time-series analyses should be based on two primary considerations. First, there should be a strong likelihood that such studies could reasonably be expected to produce credible evidence. This does not mean that effects would be found — rather that the studies could detect an effect if one existed and determine whether any observed change should be attributed to the implementation of PPS. For example, the time-series analyses could show that the formal implementation of PPS in hospitals had no incremental effect above the trend established by TEFRA and/or the passage of PPS on any outcome. In this case, no further attributive studies which rely on analyses of different groups of hospitals beginning DRG reimbursement at different points in time should be done. Carefully designed change-over-time studies might, however, prove to be useful in identifying important changes in expenditures for or the use of post-hospital care services.

Second, the results of attributive studies should be policy-relevant. That is, there should be a reasonable possibility that PPS could be changed or modified in a way which would alleviate the problems it may have caused. Otherwise, substantial resources should not be committed to attributive studies. Instead, approaches to testing potential solutions to perceived problems, including experiments and demonstrations, should be emphasized.

While information obtained from the time-series studies could lead to other conclusions regarding possible effects of PPS, we believe that evaluations of the effects of PPS on patient condition at the time of hospital discharge would be particularly useful and important. Patient condition at discharge provides information about both the process of care inside the hospital and post-hospital care requirements. Supplementing data on patient condition at discharge with information on the types of post-hospital care patients receive, and how this relates to the subsequent use of health services, including hospital readmissions, could be particularly valuable. Such studies would provide an indication of the effects of PPS on individual Medicare beneficiaries. Valid measures of patient condition based on data obtained from medical records are likely to become available in the near future. Given the development of these measures, it would be quite reasonable to begin now the process of designing studies of the effects of PPS on patient condition.

Attributive studies of the effects of PPS on patient access to post-hospital care or the quality of post-hospital care (as opposed to hospital care) are less likely to be useful in understanding or resolving problems in these areas. Other factors, such as the availability or cost of the services, are more likely to be important. In addition, adequate measures do not currently exist; when developed, they might require information not routinely available from existing records.

While attributive information may not be required on each of the five outcomes, we believe that some type of information (e.g., descriptive) on each of the outcomes is needed. The primary impediment to studies is the lack of suitable measures. Thus, the first step in studying these outcomes is additional measurement development and testing. To use available resources most efficiently, HHS should coordinate measurement development efforts with the expected requirements of evaluations. If attributive studies that rely on medical record data are being planned, measurement development should focus on measures using such data. Some of this work has begun at HHS, but further efforts will be required, particularly in the measurement of access to and quality of post-hospital subacute care. For the outcomes of use and expenditures, an examination of what can be done to expand the data available for evaluating Medicaid and community-based services may be desirable.

## Summary

We find that questions concerning the use of and expenditures for post-hospital subacute care, and to a more limited extent, the quality of that care, can and should be addressed using a time-series approach with existing Medicare administrative data. The availability of the data and relatively low cost mean that there are no compelling reasons for not doing these analyses.

A second strategy could be used in conducting attributive studies relating to patient condition at hospital discharge, access to post-hospital care, and a more complete examination of quality of post-hospital care. It would first be necessary to develop and test measures which could be applied to existing data sources. In addition, the need for original data collection means that these studies are likely to require substantially more time and money than the proposed time series analyses. The strategies do, however, provide a feasible alternative for addressing those questions for which relevant data currently do not exist. Based on current information, we believe that studies of the effects of PPS on patient condition at time of hospital discharge would be useful.

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Chapter 4

# HHS Evaluations Will Provide Little Information About PPS Effects on Post-Hospital Care

This chapter examines the work that the Department of Health and Human Services has done or plans to do to evaluate the effect of PPS on post-hospital subacute care services and compares it to the evaluation plan presented in chapter 3. As background to our discussing the specific HHS work in post-hospital care, we provide an overview of HHS' responsibilities for evaluating the effects of PPS as a whole. We then examine in greater depth the main HHS research efforts which can be expected to provide information on post-hospital subacute care, including those focused on descriptive and change-over-time information, as well as attributive studies.

## The Responsibility for Evaluating PPS

### HHS Activities

#### Health Care Financing Administration

The primary agency within the Department of Health and Human Services responsible for the Medicare program, the Health Care Financing Administration (HCFA), must both administer the day-to-day operation of the program and provide information for the development of new policies. While there are a number of offices within HCFA which are involved in the analysis of data to support administrative operations (e.g., the Bureau of Quality Control and the Bureau of Data Management and Strategy), HCFA's Office of Research and Demonstrations (ORD) is the primary source of information for the development of new Medicare policy. The April 1985 Status Report on HCFA's research and demonstrations listed over 300 studies, of which research and evaluations of PPS make up just one component. ORD is also responsible for evaluations of such programs as Medicaid, and Medicare's end-stage renal disease and hospice programs.

Some of the studies that HCFA funds derive from congressional mandates. This is particularly true with regard to PPS. The Social Security Act Amendments of 1983, which set up the PPS system, called for a series of reports, demonstrations, and experiments (see appendix VI).[1] Several of the mandated studies require HCFA to examine extensions of

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[1] These mandated studies were not separately costed out and authorized. Nor was HCFA's budget adjusted to reflect the additional effort represented by the congressional mandates. Therefore, HCFA

PPS to other providers or refinements to the hospital DRG system in areas such as capital costs. Other mandated studies include evaluations of particular health care demonstration projects (e.g., the On Lok Senior Health Services program in San Francisco providing Medicare and Medicaid services to the frail elderly) and of waivers from PPS given to several states with their own prospective payment systems. Further studies were mandated in the Deficit Reduction Act of 1984. The House Appropriation Committee Report accompanying the 1985 HHS appropriation bill also requested some additional studies (see appendix VI). In the conference report on the fiscal year 1986 HHS appropriation bill (Public Law 99-178), particular congressional interest was expressed in HCFA studies of quality of care, including nursing home and home health care as these relate to Medicare PPS.

Much of the work on the mandated studies will be done by either the Brandeis University Health Policy Consortium (cost and reimbursement issues) or the Rand/UCLA Health Financing Policy Research Center (advice on evaluations and demonstrations, technical assistance and support on the preparation of the Annual Report to Congress). HCFA has awarded each of these groups cooperative agreements to provide ongoing advice and assistance on a wide variety of projects as well as to conduct specific analyses as assigned. For example, Rand has been developing a research agenda for looking at quality-of-care issues.

HCFA annually reviews proposals for grants and contracts to be funded with its discretionary research funds. In addition to the Brandeis and Rand/UCLA health policy centers, a number of the research projects funded in recent years have examined various effects of PPS. In September 1985, HCFA awarded a contract to Abt Associates to provide survey design, data collection, and statistical analysis in support of the mandated annual PPS impact reports. Initial work assignments under this contract include assembling a project data base, conducting a survey of hospital decisionmakers on PPS effects, and compiling and analyzing patient-level data on the relationship between PPS and patient outcomes.

## Other HHS Activities

Elsewhere within HHS there are other organizations which have related responsibilities. For example, the National Center for Health Statistics

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must support the work necessary to respond to these mandated studies from its regularly appropriated funds. In some cases, the work is done intramurally. In fiscal year 1985, approximately $10 million of the $32.6 million available for extramural research and demonstrations was spent on congressionally-mandated studies related to HCFA's areas of responsibility.

(NCHS) is responsible for collecting general information on the health status of the population, including the elderly. The National Center for Health Services Research and Health Care Technology Assessment (NCHSR) is responsible for supporting basic research into health services. In addition, the Office of the Inspector General and the offices which deal with aging issues (e.g., Office of Human Development Services) have conducted small-scale studies related to PPS. The health policy and social services staff under HHS' Assistant Secretary for Planning and Evaluation (ASPE) plays a role in collecting information, funding studies, and coordinating research efforts by the various agencies and offices within HHS which share responsibility for making policy decisions regarding PPS. Finally, each of the 54 state-level Peer Review Organizations (PROs) established in 1982 to monitor the performance of Medicare providers collects a substantial amount of information relevant to assessing the effects of PPS on hospital services and inpatient care, although to a considerable extent these data cannot be aggregated across different PROs because they are not assembled in a uniform manner (see appendix III).

## PPS Studies by Congressional Agencies

While the primary responsibility for evaluating the effects of PPS rests with HHS, the congressional agencies (Office of Technology Assessment, Congressional Research Service, Congressional Budget Office, and GAO) and the independent Prospective Payment Assessment Commission (ProPAC) have also been involved in monitoring the implementation of this major policy initiative. For example, at the request of the Senate Committee on Finance and the Senate Special Committee on Aging, the Office of Technology Assessment (OTA) has recently completed an extensive study of issues which need to be considered in evaluating the effects of PPS on health care services and the health care system as a whole. Their report focused primarily on hospital issues such as the quality of care, medical technology, and clinical research.[2] The Congressional Budget Office has examined the likely effects of PPS on different categories of hospitals.[3] The General Accounting Office is engaged in a range of studies examining various aspects of PPS, including studies of PRO operations, hospital cost reports, and the data used to calculate DRG base rates.[4]

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[2] Office of Technology Assessment, Medicare's Prospective Payment System: Strategies for Evaluating Cost, Quality, Access and Medical Technology (Washington, D.C.: U.S. Government Printing Office, October 1985). This study provides a comprehensive review of issues related to the evaluation of PPS effects on the quality of care, access to health care, expenditures and costs, technological change, and clinical research. In addition to reviewing the key policy issues which need to be addressed, this report discusses available data sources and evaluation approaches likely to produce useful results. The emphasis in the OTA report is on PPS effects on inpatient hospital care, but some discussion of post-hospital and long-term care issues is presented.

[3] Congressional Budget Office, "An Analysis of the Impacts of a DRG-Specific Price Blending Option for Medicare's Prospective Payment System," December 20, 1984.

The Prospective Payment Assessment Commission (ProPAC), established by the Social Security Amendments of 1983 which authorized Medicare PPS, is charged with the responsibility for making recommendations to HHS regarding periodic adjustments to the PPS system. These include changes to overall payment amounts (e.g., general adjustment for inflation) and to payment for a specific DRG (e.g., to account for a change in accepted treatment regimen or the use of new medical technology). While ProPAC was not originally established to evaluate the PPS system, language written into the House Appropriations Committee Report on the 1985 Departments of Labor, HHS, Education and Related Agencies Appropriations Act (Public Law 99-178) strongly asserted congressional interest in ProPAC's views on PPS effects. The report indicated that "the primary role of the Commission lies in a broader evaluation of the impact of Public Law 98-21 on the American health care system".[5] In support of this role, the Committee directed ProPAC to submit an annual report analyzing the effects of PPS. The first report was issued in February 1986.

## Information HHS Currently Plans to Develop

Post-hospital subacute care constitutes one of a number of areas where the introduction of PPS could have effects of concern to Medicare policymakers. Many of the congressionally mandated studies of PPS have focused HHS resources on acute care issues, e.g., the likely effects of potential modifications of PPS on hospitals and physicians. However, several studies of PPS mandated by the Congress have included questions related to post-hospital care. For example, the Congress specifically mandated a study (released April 1985) of the potential effects of extending PPS to SNFS (see appendix VI). More broadly, the Social Security Amendments of 1983 require HHS to provide attributive information on the effects of PPS by directing the department to:

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[4] See, for example, General Accounting Office, Use of Unaudited Hospital Cost Data Resulted in Overstatement of Medicare's Prospective Payment System Rates, GAO/HRD-85-74 (Washington, D.C.: July 18, 1985).

[5] U.S. House of Representatives, Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriation Bill, 1985: Report to Accompany H.R. 6028 (Washington, D.C.: July 26, 1984), p. 140.

study and report annually to the Congress at the end of each year (beginning with 1984 and ending with 1987) on the impact, of the payment methodology under section 1886(d) of the Social Security Act during the previous year, on classes of hospitals, beneficiaries, and other payors for inpatient hospital services, and other providers, and in particular, on the impact of computing DRG prospective payment rates by census division, rather than exclusively on a national basis.[6]

We have not attempted to weigh the relative importance of analyzing hospital care or other health services issues as opposed to PPS effects on post-hospital subacute care. Given both the concerns raised about potential problems for post-hospital care and the competing demands for studies in other areas, this section simply describes how HHS has decided to examine the issue of PPS effects on post-hospital care and the nature of the anticipated information — descriptive, change-over-time, and attributive - that it plans to develop. Table 4.1 summarizes activities sponsored by HHS which can be related to developing information on the effect of PPS on post-hospital subacute services. The origin, nature, and type of information to be produced by these activities are discussed in greater detail below. In addition, we examine the work that HHS has underway which can potentially contribute to needed measurement development in the areas of patient condition at discharge, access to and quality of post-hospital subacute care.

**Table 4.1: HHS Studies Addressing PPS and Post-Hospital Subacute Care**

| Basic activities | Status | Estimated extramural cost |
|---|---|---|
| Annual report to Congress - 1984[a] | Released 11/12/85 | (Intramural) |
| (HCFA) - 1985[a] | Due 12/31/85 | (Intramural) |
| - 1986[a] | Due 12/31/86 | (Intramural) |
| Brandeis University Health Policy Research Consortium (HCFA)[a] | Ongoing: 1984-1989 | $1,525,000 |
| Rand/UCLA Health Financing Policy Research Center (HCFA)[a] | Ongoing: 1984-1989 | $1,525,000 |
| Abt Associates Prospective Payment and Analytic Support Studies[a] (HCFA) | Ongoing: 1985-1988 | $5,200,000 |
| Descriptive surveys | | |
| National Long-Term Care Survey | 1982 data collected | $ 975,000 |
| (ASPE/HCFA) | 1984 data collected | $1,800,000 |
| National Nursing Home Survey | 1973-74 data collected | 700,000 |
| (NCHS) | 1977 data collected | $1,100,000 |
| | 1985 data being collected | $5,300,000 |

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[6] Public Law 98-21 (1983) (to be codified in 42 U.S.C. 1395ww).

| Basic activities | Status | Estimated extramural cost |
|---|---|---|
| National medical expenditures surveys | | |
| NMCES (NCHSR/NCHS) | 1977 data collected | $23,700,000 |
| NMCUES (NCHS/HCFA) | 1980 data collected | $19,550,000 |
| NMES (NCHSR/HCFA) | 1987 data collection planned | Not available |
| Change-over-time studies | | |
| National Home Health Study (HCFA) | Briefings given, 3/85 | (Intramural) |
| National SNF Study (HCFA) | In planning | (Intramural) |
| Beneficiary Profiling System (HCFA)[a] | In progress, scheduled completion 1986 | (Intramural) |
| Comparison of the Cost and Quality of | 1980, 1982-83 data collected | $1,579,000 |
| Home Health and Nursing | 1986 data collection planned | |
| Home Care (HCFA/University of Colorado)[a] | Scheduled completion 12/86 | |
| Hospital Cost and Utilization Project | 1970-77 data collected | (Intramural) |
| (NCHSR) | 1980-87 data being collected | |
| Impact of PPS on the Quality of Inpatient Care (HCFA/CPHA)[a] | Scheduled completion late 1988 | $145,000 |
| Quality of Inpatient Medical Care Study (HCFA/Rand)[a] | Scheduled completion late 1988 | $2,865,000 (under negotiation) |
| Dependency at Discharge: Impact of DRGs (HCFA/Northwest Oregon HSA)[a] | Scheduled completion Summer, 1986 | $36,000 |
| Attributive Studies | | |
| Selected Analyses of PPS Impact on | Scheduled completion early 1987 | $480,000 |
| Hospitals' Behavior (HCFA/Urban Institute/ Georgetown Univ.)[a] | | |
| Prospective Payment System and Post-hospital Care (Georgetown Univ.)[a] | Scheduled completion 1988 | $706,000 |
| Evaluability Assessment of the Medicare PPS on Long-Term Care | Completed 2/1986 | $130,000 |
| (ASPE/Urban Institute);[a] | | |
| Assessing Post-Hospital Discharge | Scheduled completion late 1986 | $135,000 |
| Behavior Feasibility Study[a] | | |

[a] These studies are being conducted to address PPS issues. The other studies may include information which could be relevant to evaluations of the effects of PPS on post-hospital care.

Two general observations, however, can be made before proceeding into a detailed analysis of individual activities. First, it is clear from table 4.1 that the level of effort and resources devoted to developing attributive information on post-hospital care is very small relative to the overall portfolio of studies. Moreover, the ASPE/Urban Institute studies listed under the "attributive studies" heading are only preliminary feasibility analyses of evaluation options. Second, the level of expenditures for many of the major descriptive and change-over-time studies ($1 to $5 million dollars) of general long-term care issues is similar to the level of expenditure we estimated to be necessary to develop attributive information on specific PPS effects using the retrospective nonequivalent control group design (see chapter 3). The cost of primary data collection, whether for descriptive, change-over time, or attributive studies, is always relatively high.

## Basic Activities

The information relating to post-hospital subacute care which will be included in the annual reports mandated by the Congress can come from a number of sources. These include the specific studies which we will describe in the following sections and special analyses conducted by HCFA staff.

Although due to the Congress December 31, 1984, the first PPS annual report was not released by HHS until November 12, 1985 and then only in response to a subpoena from the Senate Special Committee on Aging. Limited information comparing pre-and post-PPS use of and total expenditures for post-hospital services is presented in that report, and there is no information on the per-case costs of post-hospital care, patient condition at discharge, or access to or the quality of post-hospital care. The information on the use of SNF and home health services in the 1984 annual report is based on analysis of discharge destination codes from samples of bills from hospitals on PPS and PPS-eligible hospitals not yet on PPS. While the total percentages indicating a discharge to either type of post-hospital care are small (less than 5 percent), the proportion of cases indicating discharge to home health care and to SNF care was higher in PPS hospitals than in hospitals not yet on PPS (more than three times higher in the case of home health care, nearly three times higher with respect to SNF care). As noted in the report, however, the accuracy of discharge destination data is questionable.[7] There is no information in the 1984 report about SNF or home health care use based on analyses of SNF or home health data files. Only very limited data on changes in Medicare benefit payments from 1983 to 1984 are presented. The average rate of increase for Medicare SNF and home health payments is reported at 9.0 and 22.8 percent, respectively.[8] According to the report, "the growth in skilled nursing payments has accelerated somewhat in the last two years," and "the growth rate of home health payments seems to have continued at its pre-TEFRA level, or higher."[9]

According to HCFA officials, the fiscal year 1985 annual report is expected to contain more descriptive information on post-hospital services and limited information about changes in these Medicare services over time. The report will include descriptions of pre-PPS use of and expenditures for post-hospital services and some analyses of changes in the staffing and structure of SNFs and home health agencies (HHAs). For example, one planned analysis would look at changes in the number, types, and staffing of home health agencies based on the Provider of Service (POS) file (see appendix III). Another planned analysis would examine data in the Medicare/Medicaid Automated Certification System for changes in staffing, organization, and patient characteristics in certified SNFs. In general, the analyses planned for the fiscal year 1985 report deal primarily with providers rather than with beneficiaries.

The fiscal year 1986 annual report is in the planning stages but HCFA officials indicated that they hope that sufficient post-hospital billing data will be available to begin to look at pre-post changes in the use of and expenditures for post-hospital services. The 1986 annual report will be the first to have change-over-time information derived from beneficiaries' bill records, but only simple analyses of changes in use and expenditures are planned. According to the 1984 annual report, several topics pertaining to PPS effects on the cost of care to beneficiaries, access to care, and the quality of care have been proposed for future analysis using Medicare administrative data; but the extent to which post-hospital care will be addressed is not indicated.[10]

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[7] Department of Health and Human Services, Report to Congress: The Impact of the Medicare Hospital Prospective Payment System, 1984 Annual Report (Washington, D.C.: November 1985), p. 8-15. In comparing hospital abstract data on patient discharge dispostions with information obtained in site visits from several hospital discharge planners, GAO found that the abstracts seriously underreported dispositions to home health and SNF care; see Information Requirements for Evaluating the Impacts of Medicare Prospective Payment on Post-Hospital Long-term Care Services, GAO/PEMD-85-8 (Washington, D.C.: February 21, 1986), p. 6.

[8] HHS, The Impact of the Medicare Hospital Prospective Payment System, 1984 Annual Report, table 10.4.

[9] HHS, The Impact of the Medicare Hospital Prospective Payment System, 1984 Annual Report, pp. 10-10 and 10-11.

In short, HHS annual reports will provide only a limited amount of descriptive information about post-hospital care in the relatively near future. In time, HHS expects to develop simple change-over-time information, first for post-hospital care providers and then on use and expenditures for beneficiaries. However, in none of the annual reports does HHS plan to furnish any information regarding the extent to which PPS was responsible for observed changes among post-hospital care providers and beneficiaries.

## Descriptive Information

HHS has conducted or plans to conduct surveys which will produce descriptive information related to post-hospital subacute care issues.

### The National Long-Term Care Survey

Carried out in 1982 and 1984, the National Long-Term Care Survey has collected data on functional status and use of services (both formal and informal) by functionally impaired elderly living at home. Thus, for this portion of the elderly population, baseline data on post-hospital service use and expenditures (including out-of-pocket expenses) will be available for a period fairly closely preceding the implementation of PPS, as well as data from the period during which PPS came into effect. Because data from the 1984 round will contain a mixture of pre- and post-PPS experiences, the survey itself will provide no clear post-PPS observations to compare with the 1982 data. In addition, expenditure data from both rounds are limited and there are no data on the use of institutional care in 1982. Both surveys can be linked to Medicare part A data, which could thus provide accurate expenditure data for any Medicare SNF or home health services used during the survey period.

### The National Nursing Home Survey

Successive rounds of the National Nursing Home Survey (1973-4, 1977, and 1985) have looked at the characteristics and use of services by residents of nursing homes, many of whom are frail elderly. The descriptive data available on post-hospital outcomes are limited because these surveys have not been specifically targeted to Medicare beneficiaries who have had a recent hospitalization, but rather to persons with chronic disabilities or health problems. Changes over time between the second and third rounds could be analyzed, but the six-year gap between the 1977 round of data collection and the implementation of PPS will make it difficult to attribute any observed changes between one round and the next to any specific factor, including PPS.

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[10] HHS, The Impact of the Medicare Hospital Prospective Payment System, 1984 Annual Report, p. 11-4.

## National Medical Expenditures Survey

HHS is also planning the National Medical Expenditures Survey. This will be a major study of health care utilization and expenditures for a representative sample of all U. S. households (elderly and non-elderly) and will include descriptive information about out-of-pocket health care expenditures. As discussed in appendix III, such information is difficult and costly to acquire. This survey will be the first opportunity since the introduction of PPS to obtain national estimates of total episode-of-illness expenditures for Medicare beneficiaries, including those residing in institutions. The extent to which the survey will produce accurate information on service utilization and expenditures specifically for the elderly who had a hospital stay during the data collection period will depend on sample size and the procedures used to verify individual sources of payment. Although substantial time will have passed between the implementation of PPS in 1983/1984, the collection of these data in 1987/1988, and the availability of the results, projected for 1988 to 1990, the survey could provide extensive descriptive information about the post-PPS environment.

## Peer Review Organization Data

The 54 Peer Review Organizations (PROs) collect a limited amount of descriptive information on the hospital care received by Medicare patients, but none on post-hospital care (see appendix III). PROs do analyze medical records to assess condition at discharge for patients who have been readmitted to a hospital. However, for a number of reasons this information is likely to have highly limited utility as an general indicator of trends in patient condition at discharge. The primary reason is that the definition of a readmission is very restrictive. Only patients readmitted to hospitals within seven days and with diagnoses related to the diagnoses for the previous admissions were reviewed under the provisions of the original PRO contracts. The readmission review period has been increased to 15 days in the PRO contracts to be awarded in 1986. Nevertheless, patients who are discharged prematurely but who do not return to a hospital within 15 days are unlikely to be reviewed by the PROs. In addition, PROs set their own standards for determining when a premature discharge has occurred. These standards are expected to reflect local medical practice as interpreted through the judgment of PRO reviewers as medical practitioners. As a result, PROs as presently organized are not producing usable, uniform data on patient condition at discharge for the national Medicare program as a whole. (Appendix III discusses these points in greater detail.)

## Change-Over-Time Information

### National Home Health Study

This study, conducted by the Bureau of Quality Control (HCFA) was designed primarily as an audit of the determinations of fiscal intermediaries regarding coverage of home health claims. The study was concerned with the extent to which Medicare was reimbursing home health services that did not qualify for Medicare coverage and the reasons for any inappropriate payments. As an adjunct to the study, the Bureau of Quality Control also collected information on the volume of patients and average number of visits per patient in their sample of home health agencies in the fourth quarter of fiscal 1983 (pre-PPS) and the fourth quarter of fiscal 1984 (post-PPS). A similar study of SNF care is in the planning stages.

The findings of the National Home Health Study were not published, but a summary of the findings was made available through briefings.[11] With respect to PPS, all that the Bureau of Quality Control reported was a lack of significant change in either the proportion of patients referred to the agencies from hospitals or in the number of services provided to home health patients in the year after PPS took effect. Specifically, the Bureau of Quality Control staff calculated an overall increase of 12 percent in the volume of patients seen in the year, a figure which HHS indicated was not a statistically significant increase.

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[11] According to the analyses done by Bureau of Quality Control staff (which have never been made available publicly), there was no increase in the percent of the agencies' caseload coming from hospitals (62 percent both before and after). However, there was a 12 percent increase in total caseload and a small but not statistically significant increase in the number of services per patient. Based on information provided to GAO by HHS, hospital-based agencies experienced the largest increase in referrals to home health agencies, with a rise of 45 percent. Freestanding agencies declined slightly in referrals (3.4 percent). In addition, hospital-based agencies declined 15.6 percent in the average number of skilled nursing visits while freestanding agencies had an increase of 8.4 percent. One possible explanation of this pattern of results is that hospitals began referring more patients who needed fewer visits to their own agencies. This could result in fewer patients for freestanding agencies and patients with a need for relatively more visits. It is also possible that increases in the number of agencies could affect the rate of growth in each agency's caseload. This pattern is also consistent with information we gathered for our February 21, 1986, report, PEMD-85-8; see footnote 7 above.

For a number of reasons that go beyond the normal limitations of change-over-time studies, both the results reported by the Bureau of Quality Control and any additional analyses made using these data should be viewed as highly tentative. First, the "pre-PPS" observation occurred after the passage of the PPS legislation and therefore could be atypical of pre-PPS conditions due to anticipatory changes. Additionally, because hospitals in a particular area may have begun operating under PPS at different times, some patients entering home health care in the pre-PPS sample could have been discharged from hospitals about to begin PPS reimbursement, while others were discharged from hospitals almost a year away from operating under PPS. Moreover, the sample size was quite small (21 home health agencies selected from over 5000 certified agencies nationally) and although originally intended to be nationally representative, there are reasons to question that characterization. Estimates based on a sample of 21 agencies divided into four types of agencies (i.e., hospital-based, SNF-based, free-standing and public) would have large sampling errors. Further, because the 21 agencies included in this part of the study represent only 54 percent of the 39 agencies originally sampled, there is a substantial threat to generalizability; that is, the achieved sample may not be representative of home health agencies nationally.

### Beneficiary Profiling System (HCFA/Bureau of Quality Control)

The Bureau of Quality Control is currently also developing a database called the Beneficiary Profiling System which will contain information from Medicare part A and part B bills for independent random samples of beneficiaries both before and after the introduction of PPS. Originally, the samples were limited to beneficiaries discharged from hospitals having fiscal years beginning in January 1984 in four states: California, Virginia, Colorado and Texas — but additional post-PPS data are being collected in several more states. The samples consist of 20 percent of Medicare patients discharged from the hospitals at four points in time, November 1983 (pre-PPS for these hospitals) and March 1984, November 1984, and March 1985 (post-PPS). For certain special groups of patients, including those with unusually long lengths of stay or high cost and those readmitted within 14 days, 100 percent samples will be drawn from the hospitals. The claims submissions for each of the sampled patients will be followed for the ensuing six month period.

The Bureau of Quality Control expects to develop information on changes in numbers of days spent in SNFS, numbers of home health visits, changes in intensity of services received, readmissions, deaths, and changes in patterns of provider referrals following discharge from the hospital.

These data should help to pinpoint areas where problems could be developing, such as rapid increases in rates of utilization of certain sub-acute care services. However, data are still being collected, and no analyses have been completed. Currently, there are no plans to publish any of the results although there may be public briefings.

Several of the limitations presented above with respect to the Bureau of Quality Control home health study apply here as well. The pre-PPS observations are restricted to a period only shortly preceding the formal implementation of PPS in these hospitals and thus will be affected by any anticipatory effects of PPS. That is, these baseline data will not reflect the absence of PPS, as is needed for a clear pre-post comparison. In addition, the generalizability of observed changes will be limited to four states. However, the Beneficiary Profiling System will have a number of advantages over the home health study. First, a considerably wider range of information will be collected, including expenditures, readmissions and mortality, and the full spectrum of Medicare-covered post-hospital care. Second, the sample sizes should be adequate to support generalizations to the four states. Third, the comparisons across time will be easier to interpret, both because of the additional post-PPS observations and the fact that PPS came into effect at the same time for all of the sampled patients.

## Clinical Analysis of PPS Impacts on the Quality of Inpatient Medical Care (Rand)

In fiscal year 1986 the Rand Corporation was awarded a contract of nearly $3 million to evaluate the effects of PPS on quality of care through an examination of changes in inpatient hospital treatment patterns. The study will involve thorough reviews of medical record data and resultant health status outcomes. A pre-post design for fiscal years 1982 and 1985 will be used, involving a sample of about 21,000 discharges for six specific conditions. Methodological issues such as the inclusion of a comparison group (in the form of non-Medicare patients aged 55-64) and additional baseline data collection are still under discussion. While the study will focus on inpatient care, data on patient condition at discharge and post-hospital discharge data from Medicare utilization files will also be compiled. This will allow the researchers to link data on patients' clinical care to their use of post-hospital care covered by Medicare, which could indicate if there are quality of care problems related to inpatient treatment patterns and discharge decisions. The study does not address quality of care in post-hospital settings.

### Dependency at Discharge Study (Northwest Oregon Health Systems Agency)

In 1985, HCFA awarded a research contract to support a small-scale study applying a newly-developed instrument designed to measure individual patient dependency as an indicator of patient care needs at the time of hospital discharge. This measurement tool is based on six scales: activity and mobility, bathing and hygiene, number of medications, procedures, signs and symptoms, and age; the information needed to compute scores is drawn from hospital medical records. This study includes only four hospitals in the Portland, Oregon area, and cases representing five DRGs were included. In the initial phase of the study, only three medical DRGs were analyzed; two surgical DRGs will be included in future analyses. The measurement tool was applied to records from the sampled hospitals in one pre-PPS time period (November, 1981 - December, 1982) and one post-PPS period (April, 1984 - July, 1985). In the completed analysis, the data from the 3-year time frame will be divided into eight segments, six before and two after the implementation of PPS.

The limited scope of the study will mean that the findings will not be generalizable to the nation, and additional work needs to be done to examine the relationship of any observed changes in this measure of dependency to the use of subacute care services and health care outcomes. However, this study represents a systematic effort to develop valid measures which can identify changes in patient condition at discharge.

### Studies of Changes in Hospital Behavior Affecting Post-Hospital Care

Two on-going or planned research efforts may provide useful information on changes over time in hospitals' discharge practices and involvement in providing post-hospital services. (A third is discussed below because it will provide attributive information as well.) HCFA has contracted with the Commission on Professional and Hospital Activities (CPHA), a nonprofit organization which operates a very large hospital discharge abstracting service, to analyze CPHA file data from pre- (1981-83) and post-PPS (1984-88) periods to test a series of hypotheses about changes in quality-related process and utilization activities, including percentages of discharges to SNFs and home health agencies (based on hospital abstract data for those hospitals included in the CPHA system). In addition, the Hospital Cost and Utilization Project being conducted by NCHSR is collecting and collating hospital, patient and county-level data on health services and demographic variables for a sample of several hundred short-term general hospitals. These data will include information on patient discharges to post-hospital care which will be linked to patient characteristics such as severity of illness indicators, hospital characteristics such as hospital financial position, physician characteristics such as specialty, and local health care market factors.

### Other Studies of Change-Over-Time in Post-Hospital Services

In addition to the studies discussed above, a new round of data collection to be conducted by the University of Colorado group studying case mix, quality and costs in home health agencies and nursing homes will also provide pre-post PPS comparisons of the condition of patients residing in nursing homes and receiving home health care, (i.e., not at hospital discharge). This study is described below, along with other studies related to the development of measures appropriate to investigating post-hospital care outcomes.

## Attributive Information

Of the HHS investigations of the relationship of PPS to post-hospital subacute care that we examined, only two related studies conducted by the same researchers seek to establish the extent to which PPS was responsible for observed changes. Funded by contracts with the Urban Institute and the Georgetown University Center for Health Policy Studies and sub-contracts to the American Hospital Association, data from several pre- and post-PPS hospital surveys will be used to assess the effect of PPS on aspects of hospital management and services, including patterns of discharges to post-hospital care and hospital expansions into SNF and home health activities. A survey of nursing homes and home health agencies operating in the same markets as the study hospitals will provide additional information on patterns of post-hospital care demand and use.

What distinguishes this approach is its use of longitudinal data on revenues and costs for the sampled hospitals. This permits quantification of the extent to which each has gained or lost from the introduction of PPS relative to where it would have been had the previous cost-based reimbursement system continued. This PPS gain/loss factor will be entered into a multivariate analysis along with a range of other factors also considered likely to affect hospital decisions. In this way, the study will attempt to assess the specific effect of PPS on changes in hospital provision of post-hospital care and discharges to SNFs and home health agencies. This approach assumes that hospitals most affected by the change to PPS will be most likely to make changes in their operations and/or patient care patterns. If this assumption is not valid, this approach will not produce credible information on the effects of PPS.

These studies will produce atttibutive information about PPS effects on certain hospital management decisions relating to post-hospital care. However, only one of the five outcomes identified as important in chapter 1 will be addressed—the use of post-hospital services. Thus, information will be obtained on whether the level of "financial squeeze" associated with PPS has changed hospital discharge patterns, but no information would be collected on how any such changes might be related to patient condition at discharge. Surveying subacute care providers may not provide valid information about how PPS economic incentives have affected the quality of subacute services. Providers may not always give objective information on the quality of their services, and they may not be fully aware of all the factors affecting the operation and regulation of health care services.

HHS may be preparing to address PPS effects on post-hospital care more extensively in the future. ASPE has another contract with the Urban Institute to develop an evaluability assessment (i.e., a study to examine important policy issues in specified areas and the feasibility of designing evaluations of them) in the area of post-hospital care. The objective of the study is to develop recommendations for evaluating the effects of PPS.

## Measurement Development Studies

In addition to studies which examine the relation of PPS and post-hospital care directly, HHS has sponsored a number of studies which may contribute to developing measures of patient condition at discharge and the quality of post-hospital care. As noted in chapter 3, such research is needed before further work in these areas can proceed. These are briefly described below. We found no similar studies addressing the problem of measuring access to post-hospital care.

### Measuring Patient Condition at Hospital Discharge

HCFA is currently funding a number of research efforts to develop of measures of patient condition. These studies chiefly focus on ways of compensating for variation in severity and resource requirements of particular patients whose hospital stays are classified under the same

DRG. These new measures thus could be used to adjust DRGs in order to more accurately reflect variations in the total cost of providing appropriate treatment for patients with varying needs. For example, two studies seek to develop and/or test measures of nursing intensity to be used in conjunction with DRGs, another will develop patient management categories that have relatively homogeneous cost requirements, and a fourth will test a four-level severity ranking within the existing DRGs.[12]

Two characteristics that these approaches generally share are 1) except for the last study, the focus is on resources expended or required for appropriate care rather than patient condition per se, and 2) three of these four attempt to describe the seriousness of total episodes of illness and are not designed to track changes in patient condition and needs at different time points in the course of hospitalization. The exception is one study of nursing intensity, which has as one of its goals developing a measure of patient care requirements to be collected on a daily basis. However, this limited pilot study will only involve two Milwaukee area hospitals and 20 high-volume DRGs. Otherwise, HCFA's work on measures of patient condition does not appear to be oriented toward measures that would be capable of assessing patient condition at time of hospital discharge.

One study being planned by ASPE, however, would address the issue of patient condition at discharge in terms of Medicare patients' post-hospital care needs. The study would develop a methodology which uses information from hospital records to group patients into three categories: those not requiring post-hospital care, those requiring short-term subacute skilled care, and those requiring long-term care as the result of chronic disability or illness. After identifying these patient populations, the study would also determine the feasibility of tracking each population to determine if their post-hospital health care needs were being met adequately.

## Research on Measuring Quality of Care

In this section we describe two sets of studies of particular relevance in some detail, and then briefly summarize a number of additional studies.

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[12] "Diagnosis-Related Groups and Nursing Resources" (awardee: Yale University); Diagnosis-Related Groups Refinement for Nursing Care (awardee: American Nurses Association); "Measuring the Cost of Case Mix Using Patient Management Algorithms" (awardee: Blue Cross of Western Pennsylvania); "Severity of Illness within Diagnosis-Related Groups" (awardee: The John Hopkins University School of Hygiene and Public Health).

One important quality of care study is the Comparison of Cost and Quality of HHAs and SNFs (HCFA/University of Colorado). The primary objective is to develop and apply measures of patient condition and quality of care for nursing home and home health patients. It will also collect data on the condition of patients in nursing homes and home health care both before and after PPS was implemented, thereby producing change-over-time information on the condition of patients residing in long-term care settings. Methods for assessing case mix (used here to represent the level or types of patient care needs and/or problems), as well as the costs and quality of care provided by nursing homes and home health agencies are of concern. These data will permit comparisons on cost, quality, and cost-effectiveness among different types of providers, e.g., hospital-based vs. freestanding.

The Colorado project has focused particularly on developing and applying case mix indices and outcome and process measures of quality. The case mix work relates most closely to the issue of patient condition, while the process and outcome indicators apply more to issues of quality of care. As is typical for such measures, the application of the case mix measure requires direct contact with caregivers. However, because this study has been underway for some years, pre-PPS observations are available from a substantial number of SNFs and home health agencies. HCFA will capitalize on this by funding a second round of observations in 1986 in 85 nursing homes and 20 home health agencies in 12 states that were previously surveyed in 1980, 1982, or 1983. The same survey instruments will thus be applied to essentially the same set of providers both pre- and post-PPs. This should give a fairly detailed description of changes in the types of nursing home and home health patients and their needs for care since PPS has come into effect, allowing for analyses of differences among different types of providers (e.g., SNF vs home health, hospital-based vs. freestanding, etc.). The chief problem in interpreting the results will derive from the variation among the sampled providers in the length of time between the pre-PPS observations and the implementation of prospective payment, and then the relatively long period separating PPS implementation in 1983/84 from the post-PPS observations.

Another major study related to quality of care is the Rand Investigation into Quality Indicators Study. This long-term effort involves a variety of approaches to identify and test "non-intrusive" measures of quality that rely solely on data in the Medicare Statistical System. These measures are being validated in part through abstracting data from samples of medical records.

The importance of this work, within the framework for addressing PPS effects, is in developing measures of quality of care for retrospective analyses from administrative records. Any non-intrusive quality measures derived from Medicare information systems would be good candidates for time-series analysis. The approach developed in this study could provide useful guidance in abstracting information on quality of care. However, this work does not address the quality of post-hospital subacute care. Therefore, even if the project is successful in developing and testing quality measures based on administrative data, additional work would be needed to extend the findings to quality assessments for post-hospital subacute care services.

HCFA's research relating to measuring the quality of care provided in long-term care settings falls into two broad categories. The first involves a series of projects where quality of care represents one of several outcomes of interest relative to some program intervention (e.g., variations in the reimbursement formula for long-term care, such as providing incentive payments to accept highly dependent patients or some version of prospective payment).[13] Generally, the types of quality measures used in these studies include changes in activities of daily living (ADL) scores, as well as structural indicators (basically the degree of non-compliance with program regulations found by state inspectors) and process measures (e.g., nursing hours, social work hours, etc., expended per patient). All these studies focus on the general nursing home population of chronically ill patients, rather than on measuring the quality of subacute care.

The second group of studies involves experiments in three states to derive quality of long-term care information from extant data (in nursing homes or patient records). Specifically, these studies seek to develop methods for targeting nursing home inspection activities to those providers with the greatest problems. Of most interest in terms of developing quality of care measurements is the New York state demonstration, where the state health department targets its inspection of patient care on the basis of tabulations from medical records of the incidence of 11 specific "sentinel health events", that is, reported patient conditions or occurrences which could alert reviewers about quality problems, such as accidents or decubitus ulcers.[14] Nursing homes where the incidence of these events exceeds state-set norms receive more intensive scrutiny to determine the extent to which these conditions reflect deficiencies in the care provided. However, those final quality of care determinations involve direct contact with the patients and caregivers involved, as well as detailed examinations of individual patient records.

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[13] Examples of studies in which quality of care is one outcome include: "Longitudinal Study of the Impact of Prospective Reimbursement Under Medicaid on Nursing Home Care" (awardee: University of Southern Maine, Human Services Development Institute), "Encouraging Appropriate Care for the Chronically Ill Elderly: A Controlled Experiment to Evaluate the Impacts of Incentive Payments on Nursing Home Admissions, Discharges, Case Mix, Care, Outcomes and Costs" (awardee: State of California Department of Health Services), "Can Geriatric Nurse Practitioners Improve Nursing Home Care?" (awardee: Rand Corporation), "Home Health Agency Prospective Payment Demonstration" (awardee: Abt Associates, Inc.), "Case-Managed Medical Care for Nursing Home Patients" (awardee: Massachusetts Department of Public Welfare), "Study of Long-Term Care Quality and Reimbursement in Teaching and Nonteaching Nursing Homes" (awardee: University of Colorado Health Sciences Center). Additional information on these HCFA projects can be found in HCFA/ORD, Status Report (Washington, D.C.: April 1985), and subsequent editions.

An independent evaluation of this system was undergoing final review in January 1986.[15] This evaluation assesses the effectiveness of sentinel health events as a targeting mechanism for nursing home inspections by comparing the deficiencies identified for a sample of nursing homes using this approach with those found in the same homes during a separate on-site inspection employing a detailed, standardized instrument. Sentinel health events may prove a promising approach for developing at least rough quality indicators that do not require direct contact with patients and caregivers, but so far they have not been tested for applications involving post-hospital subacute care.

## Summary

Table 4.2 summarizes our findings regarding the work being done at HHS to evaluate the effects of PPS on the five post-hospital subacute care outcomes discussed in this report:

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[14] "Improving New York State's Nursing Home Quality Assurance Program" (awardee: State of New York Department of Social Services).

[15] "Evaluation of Three-State Demonstration in Nursing Home Quality Assurance" (awardee: Mathematica Policy Research).

**Table 4.2: The Types of Information on Post-Hospital Outcomes That Will Be Produced From Ongoing or Planned HHS Evaluations**

| Outcome | Attributive (due to PPS) | Change-over-time (pre-post) | Descriptive (post-PPS) only | Measurement development |
|---|---|---|---|---|
| Patient condition | No | Limited[a] | Limited[a] | Limited |
| Use | Limited[b] | Yes | Yes | NA |
| Expenditures | No | Yes | Yes | NA |
| Access | No | Limited[c] | Limited[c] | No |
| Quality | No | Limited[d] | Limited[d] | Limited |

[a] Only on a few medical conditions.

[b] Only on changes in hospital provision of post-hospital services.

[c] Only on proxy measures for access.

[d] Only on readmissions and mortality.
NA - Not applicable

With respect to patient condition at hospital discharge, we found that no attributive and only limited descriptive and change-over-time information will be produced by HHS. Two separate studies will examine samples of medical records to determine if there were significant changes in patients' medical condition from before to after PPS for a limited number of medical conditions. Another study will provide information on pre-to post PPS changes in the types of patients entering skilled nursing facilities and admitted to home health agency care and changes in these patients' care needs.

With respect to the use of and expenditures for SNF and home health care services, we found that HHS will not provide attributive information, but likely will provide adequate descriptive and change-over-time information. In addition, HHS plans to produce change-over-time as well as descriptive information on two common indicators of quality of care, readmissions and mortality. It is not clear whether these analyses will separately address outcomes for patients who used and did not use post-hospital services. However, this is the only information on quality of subacute care that is likely to be produced.

We did not find any work going on at HHS that directly addresses the issue of access to post-hospital care for discharged Medicare patients, other than a feasibility study. Work in this area is seriously hampered by the lack of suitable measures of access. HHS will review available data for changes in bed supply or service use. These measures are sometimes used as proxies for access, but are insensitive to problems arising from possible shortfalls of supply in relation to demand for post-hospital care.

Work currently in progress at HHS could lead to better measures of patients' condition at discharge and quality of care and provide a basis for future studies in these areas. This work as well as development of measures of access to post-hospital care must be completed before any type of meaningful information can be produced on these outcomes.

Overall, as is shown in table 4.2, we found that HHS is doing very little to develop information to answer questions about whether PPS caused any observed changes in post-hospital subacute services. As a result, HHS has no adequate basis for concluding that PPS does or does not affect post-hospital care; work underway is limited and unlikely to yield information that would support such conclusions in the near future.

# Conclusions, Recommendations and Final Observations

## Conclusions

An examination of the health care environment into which PPS was introduced and of the complex, phased implementation of the program indicates that strong, credible evaluations of the effects of PPS will be quite difficult. Despite these potential problems, we believe that evaluations of some of the effects of PPS on post-hospital subacute care are feasible.

We have developed a two-part evaluation plan involving different designs for producing attributive information. The first part, which employs interrupted time-series analysis of Medicare data on use, expenditures, readmissions, and mortality, is likely to be relatively inexpensive and could be conducted in a relatively short timeframe. The results of studies of this type could help target futher efforts to develop a more complete understanding of the effects of PPS. Completion of the Medicare Automated Data Retrieval System would help facilitate this approach. The second part, which employs a nonequivalent control group design, would be based on data in medical and other records maintained by providers. Studies of this type will require the development of measures, and, like all extensive data collection efforts, are likely to be relatively expensive and take time (perhaps several years) to complete.

Comparing this evaluation plan to the work that HHS is doing, we conclude that HHS has not done, and currently does not plan to do, adequate work to produce attributive information on changes in patients' condition at hospital discharge or in the use of, expenditures for, access to, or the quality of post-hospital care. The attributive studies which are underway are designed to produce information on providers, not on Medicare patients. In summary, we conclude that HHS could, but is not, doing the work necessary to provide the Congress with an adequate basis for determining whether and to what extent PPS affects post-hospital care. Work underway is limited and unlikely to yield information that would support such conclusions in the near future.

## Recommendations to the Secretary of the Department of Health and Human Services

We recommend that the Secretary of HHS direct the Administrator, HCFA, to undertake interrupted time-series studies using data available from the Medicare Statistical System to determine some of the effects of PPS on post-hospital care. In particular, information can and should be developed about its effects on the use of and expenditures for post-hospital skilled nursing home and home health care services, and on readmissions to Medicare-covered facilities and mortality rates for episodes of illness beginning with a hospitalization.

We believe that evaluations that would allow the attribution of observed changes in these outcomes, if any, to Medicare PPS are both technically feasible and relatively inexpensive. The use of interrupted time-series studies based on Medicare data offers a valid means of addressing causal questions about the effect of Medicare PPS on post-hospital subacute care use and expenditures, as well as on limited measures of quality of care. This strategy, which constitutes the first part of our evaluation plan, would use several years of pre-PPS and post-PPS data to develop estimates of the difference between what occurred after the implementation of PPS and what would have happened in the absence of PPS. Several statistical techniques are available for developing these estimates. A particular merit of this approach is that the use of a sufficiently long series of pre-PPS observations can help evaluators rule out a variety of alternative explanations for any observed change occurring at or after the implementation of PPS. For example, this approach would allow evaluators to separate the effects of PPS on the use of home health care services from the general increase that was occurring before PPS.

Developing the necessary time-series data from the Medicare Statistical System would require extensive reorganization of Medicare data. The costs and time involved in reorganizing Medicare data and doing the necessary statistical analyses are, however, likely to be small compared to the costs associated with collecting new data. We estimate that the cost of conducting these time-series analyses would be relatively low (approximately $280,000, including the cost of completing work on the Medicare Automated Data Retrieval System). While we have not independently verified the accuracy of the administrative data in the Medicare Statistical System, we believe the benefits of such analyses, measured in terms of the information on the effects of PPS on the use of and expenditures for post-hospital services, and on readmissions and mortality rates, outweigh risks of incorrect conclusions associated with uncertainties about the data.

We recommend that the Secretary, HHS direct the Administrator, HCFA, to expedite the completion of the Medicare Automated Data Retrieval System that will reorganize the Medicare administrative data into a data file which is better able to support research and evaluation activities than are the current files.

Completion of the Medicare Automated Data Retrieval System would facilitate the type of time-series studies we have just described as well as make research on Medicare generally easier and less costly. We also believe that recent plans to omit 1980 and 1981 data from the file due to recent production problems is a serious mistake (see appendix V). Without sufficient pre-TEFRA and pre-PPS data, the usefulness of the file for change-over-time and attributive studies of PPS effects on Medicare-covered services will be drastically reduced. The completion of this project (as originally planned) should be given high priority. Medicare billing data are now available for fiscal year 1984, and it should be possible for HHS to begin constructing time-series data for later analysis. While the development of the new data system is being completed, it would be possible to use existing data systems to build time-series data for analysis of particularly important questions, including how PPS has affected the use of and expenditures for SNF and home health services. Such developmental work would not only provide useful information, but also would be helpful in preparing the way for the more sophisticated analyses which the complete part A and B billing records planned for the Medicare Automated Data Retrieval System file will make possible.

## Matter for Consideration by the Congress

The Congress has indicated its interest in obtaining information on the effects of PPS on quality of and access to both hospital and post-hospital care. Such causal analyses are possible, but they would be complicated and more costly than the work covered by our recommendations. These studies would probably require additional measurement development and extensive data collection. If the Congress deems the value of such causal studies of sufficient importance given other priorities, it should ensure, in its consideration of the HHS research agenda and budget, that adequate resources are available to carry out the work in a methodologically sound fashion.

The second part of our evaluation plan identifies an approach which could answer questions about PPS effects on patients' condition at time of discharge and better information about the effects on the quality of post-hospital subacute care than can be obtained from Medicare data on readmissions and mortality alone. It may also be possible to generate some information on the use of post-hospital care by patients needing such care— that is, on access to needed care. However, studies using this approach would be relatively expensive and have certain limitations that must be considered carefully before final decisions are made. We have suggested that studies such as these be done if analyses of Medicare data — the first part of our evaluation plan — provide indications that the information provided by such studies will be needed. Based on the limited information currently available, and the possibilities of developing valid measures, we believe that useful evaluations focusing on the effects of PPS on patient condition at discharge are possible and that planning for such studies should begin now.

This approach is based on a nonequivalent control group design using data collected from medical and other records maintained by health care facilities. Assuming that the groups of hospitals are generally similar in terms of the outcome measure in question (e.g., patient condition at discharge) or that differences between them can be built into the analyses, differences in outcomes could be reasonably attributed to PPS. For example, if patients discharged from hospitals under PPS were generally found to have been in less stable condition than patients discharged from hospitals not yet under PPS, as well as less stable than patients discharged from the same hospitals before PPS, then there is reason to believe that PPS caused this difference. However, it is also important to recognize that this approach can only directly address the effects of the formal implementation of PPS. It will not support strong inferences about changes that occurred as a result of either TEFRA or changes made in anticipation of PPS.

Nonequivalent control group studies would involve the development of measures and the collection of data from medical records. These studies would take time and would cost considerably more than the time-series studies. We estimate that studies designed to evaluate the effects of PPS on post-hospital care would cost from $700,000 to $10 million, depending on the final design, sample size and the extent of data collected. The cost of studies addressing a broad range of PPS effects on post-hospital subacute care would probably be in the high end of that range, as would the cost of studies investigating the differential effect of PPS on subgroups of patients and providers. As discussed in appendix V, the option we believe would best meet the objectives focuses on measuring effects on patient condition at hospital discharge, would cost approximately $3.1 million. The potential benefits of such studies, however, are not limited to producing information on how PPS has affected Medicare patients and subacute care providers. They could also provide measurement instruments for, and vital experience with, conducting evaluations of subacute care based on medical and other records maintained by providers.

## Final Observations

As our analysis of the options for evaluating the effects of PPS on post-hospital care has shown, the rapid enactment and implementation of changes in the Medicare program has made the task of evaluating its effects very difficult, and in some cases, impossible. If more time had been allowed for planning evaluations and collecting baseline data, some major problems in determining the effects of PPS might have been avoided. It is also possible that some information about the immediate effects of PPS on post-hospital services would now be available. However, simply allowing time for planning may not be sufficient to ensure that adequate evaluations will be done. When major changes in program policy are planned, it may be appropriate to require a plan for evaluating the effects of the changes prior to their implementation.

Given the difficulties associated with conducting evaluations of the effects of PPS on post-hospital care, expenditures for conducting these studies should be considered both in the context of research and evaluation costs as a whole and in terms of the entire research and evaluation budget available to HCFA. As we indicated in chapter 4, studies designed to collect large amounts of data in surveys and from provider records are expensive. Nationally-representative surveys of medical care utilization and expenditures represent tremendous research initiatives. The cost of a single nationally generalizable survey (e.g., NMCES, NMCUES, or the National Nursing Home Surveys) amounts to several million dollars. It should not be expected, therefore, that the costs of developing credible attributive information will be trivial.

Further, HCFA has a large amount of work to do on congressionally-mandated studies (see appendix VI), and a limited research budget available to it. In fiscal year 1984, HCFA's Office of Research and Demonstrations had an extramural budget of $32.8 million. HCFA estimates that $5.2 million of that total was spent in research and demonstrations involving hospital payment systems, and $3.1 million was directed specifically to prospective payment projects. In fiscal year 1986, the budget for the HCFA Office of Research and Demonstrations was reduced to $31 million, and large additional cuts are expected. Spending several million dollars on one study of post-hospital care would represent a substantial percentage of the total. Thus, while the potential usefulness of any attributive studies is significant, and the measurement development work required would pay dividends extending far beyond their use in PPS evaluations, it is possible that such evaluations could not be done within the limits of the current HCFA research budget without adversely affecting other projects.

In presenting an overall plan for evaluating the effects of PPS on post-hospital subacute care, we emphasize the importance of using the results of attributive studies based on Medicare data to direct further studies and of prioritizing the entire range of information needs before devoting substantial resources to studies requiring extensive data collection. For example, if the results of analyses of Medicare data indicate that PPS has caused increased readmissions to hospitals, studies that focus on patient condition at discharge and placement in appropriate post-hospital settings would be important.

We recognize, however, that pressing concerns about quality and access issues in particular may demand more immediate answers than can be achieved through systematic causal analysis. The type of information available in Medicare administrative data can provide only limited indications of possible problems, and developing good measures to apply to retrospective data may take time. For the short term, descriptive studies of patient condition at time of discharge, of problems in access to post-hospital care, and of quality problems with post-hospital subacute care services could be useful. While problems of measurement would mean that development costs could be high for descriptive studies, surveys of the current circumstances of Medicare beneficiaries in the post-PPS environment could rely on interview data and/or direct observation of Medicare patients, and would not require the careful and costly development of pre-PPS data that causal analyses do. Descriptive studies will not, however, answer questions about PPS effects. We believe that HHS will need to do more than it is currently doing or plans to do if the Congress is to have the evaluative information it has requested and needs for making policy decisions related to Medicare PPS and post-hospital subacute care services.

# Agency Comments and GAO's Response

The following sections include our recommendations as stated in the draft report, HHS's response to that draft report, and our responses to these comments. The full letter from HHS is reprinted in appendix VII.

## HHS Comments

### GAO Recommendation

- That the Secretary of HHS direct the Administrator, Health Care Financing Administration (HCFA), to undertake interrupted time-series studies using data available from the Medicare Statistical System to determine some of the effects of PPS on post-hospital care. In particular, information should be developed about the effects of Medicare PPS on the use of and expenditures for post-hospital skilled nursing home and home health care services, and on readmissions to Medicare-covered facilities and mortality rates for episodes of illness beginning with a hospitalization.

### Department Comment

- We view the evaluation of PPS as a complex, multidimensional undertaking. In developing our research agenda, we have attempted to define the universe of economic, access and quality issues relating to PPS, and their implications for beneficiaries, hospitals and other providers of care, and other payors for inpatient hospital services. Attachment 1 contains a matrix summarizing the range of evaluation issues HCFA presented in its first annual PPS report to Congress. Based on this framework, specific projects are designed and implemented on an ongoing and evolutionary basis.
- In contrast to HCFA's overall research agenda, this GAO draft report deals in considerable detail with only one subset of issues, i.e., PPS effects on post-hospital, sub-acute services. Although we clearly agree that these issues are of major importance, GAO does not place these issues into the context of the broader set of evaluation concerns—such as those included in HCFA's study matrix. For example, the report does not recognize the importance of examining the ramifications PPS may have on in-hospital medical treatment and their implications for analyzing and monitoring the quality of care, as is currently being examined through two Rand projects supported by HCFA.
- Consequently, in the GAO analysis, this work and other important projects currently underway in HCFA have been critiqued primarily for

their ability to contribute to knowledge about changes in access, use and costs of post-hospital utilization, and whether observed changes can be attributed to PPS. Since the studies in the HCFA research agenda were designed to meet a broad array of public policy concerns (including whether or not inpatient hospital treatment patterns have changed under PPS), many of our studies will not meet the sole GAO criterion of understanding post-discharge use.

- We believe that GAO should revise the report by specifically adding a background chapter which provides a broader context to its study and that explains the reason for selecting this sole issue as the major focus of its report (i.e., post-hospital care). Additionally, GAO's analysis should explain that HCFA's current and planned research responds to a much wider range of issues than those contained in the GAO's current draft report. Moreover, the GAO report should be updated to include HCFA's study of aftercare as described below. Without these changes, the current report tends to obscure the potential value of our overall research agenda.
- To study post-hospital aftercare, the GAO report proposes a basic methodology, using interrupted time series studies, for determining the effects of PPS on post-hospital discharge outcomes. These include changes in the utilization of skilled nursing facilities (SNF) and home health agency services, as well as hospital readmissions and mortality. The report references five evaluation areas related to Medicare-covered services: (1) patient condition at hospital discharge; (2) the use of post-hospital subacute services; (3) expenditures for those services; (4) access to those services; and (5) the quality of care delivered in those services.
- In addition to our concern about the limited perspective of the GAO report and the manner in which GAO critiques HCFA-supported research, it is important to note that each of the five issues raised by GAO is being addressed in a pilot study currently underway to develop methods for assessing the need and availability of hospital aftercare. Because of the importance of these issues to us, HCFA and the Office of the Assistant Secretary for Planning and Evaluation (ASPE) are working cooperatively in the design and conduct of this study. In addition to examining Medicare-covered services, the aftercare study also evaluates access, use, and costs of noncovered post-hospital care, as explained below. We are optimistic that this state-of-the-art work will allow us to advance and expand our efforts in this area even further.

## GAO's Response

GAO agrees with the characterization by HHS that the evaluation of PPS is a complex undertaking. A complete and thorough examination of all of the issues is essential for a complete and balanced picture of the effects of PPS. Their primary criticism is that we do not adequately place our evaluation plan in this overall context.

We believe that we have adequately placed our study in context. We have stated the scope of our study on pages 12 to 15 of the report. In addition, we clearly state that HHS has wide-ranging responsibilities for evaluating PPS (pp. 68 to 70). A list of mandated PPS studies is included in appendix VI. The relevant study descriptions provided by HHS as attachments to their letter are already included in Chapter 4 and are therefore not reproduced here.

There are two reasons why the scope of our evaluation plan is limited to post-hospital care. First, the congressional request was limited to the effects of PPS on post-hospital care and to the development of approaches for separating the effects of PPS from other factors. We were not asked to examine the overall research and evaluation portfolio of HCFA or to comment on the entire range of PPS issues. Second, when this study was requested by the Senate Special Committee on Aging, the Office of Technology Assessment was engaged in a study of the full range of issues involved in evaluating the effects of PPS. Their study focused in considerable detail on inpatient use, cost, access and quality. Both of these reasons for limiting the scope of our report are stated quite explicitly in Chapter 1. We do not feel that an additional background chapter (as suggested by HHS) is essential to the understanding of our basic message. Similarly, we do not believe that the attachment HHS has included which lists PPS study questions is relevant to the context of this report.

## HHS Comments

### Analysis of Hospital Aftercare Under PPS

- This pilot study represents a major project which was begun as part of the fiscal year (FY) 1986 PPS evaluation planning process. Since it was not part of our FY 1985 PPS evaluation plan, GAO may not have had any knowledge of it at the time the subject report was drafted. This project, formally entitled "Analysis of Hospital Aftercare Under PPS," has the following objectives: First, the project will develop a reliable methodology for assessing: (a) patients' functional ability and dependency at discharge; and (b) patients' usage of immediate post-discharge services. Second, the project will link functional ability at discharge to data describing aftercare as a means of assessing access and appropriateness of post-discharge (aftercare) services. In the longer-run, these data will be linked to Medicare utilization and enrollment files to permit analyses pertinent to the five issues raised by GAO. Finally, a series of case studies will be conducted on a subsample of surveyed individuals to collect additional information on the experience of Medicare beneficiaries.

1. Patient Condition at Discharge

- Patients' condition at discharge will be determined by a specially designed instrument which will be used to extract selected information from the medical record. These data will be used in determining levels of physical and mental disability and dependency (using accepted scales for measuring functional levels) and in determining patients' needs for aftercare services. In this way, we will be able to track specific subpopulations at risk at the time of discharge, such as individuals prematurely discharged from hospitals and individuals with underlying chronic conditions or functional disabilities. This instrument will be based upon work currently being done under a cooperative agreement with the Northwest Oregon Health System Agency, as referenced in the GAO report.

2. The Use of Post-Hospital Sub-acute Services

- As already noted, the aftercare study will develop a method for assessing the availability, appropriateness and use of sub-acute services combining data from a sample survey of patients' use of aftercare services with Medicare patient record data. The patient survey will collect information pertaining to both formal services (such as SNF services) and informal patient care support, as might be available from the patient's family. Other outcomes, including hospital readmissions and mortality, will be analyzed through linking hospital discharge and aftercare records with utilization and enrollment data available from the Medicare Statistical System.

3. Expenditures for Post-Hospital Sub-acute Services

- Post-hospital expenditures will be analyzed as part of the linked data base described above. Additionally, information on patients' out-of-pocket expenditures and non-Medicare payment sources will be gathered in the patient survey.

4. Access to Post-Hospital Sub-acute Services

- Access to post-hospital sub-acute services will be specifically addressed as part of the aftercare patient survey. These findings will be linked with Medicare administrative records to uncover the relationship between Medicare beneficiaries' perceptions about access problems and documented use of sub-acute facilities.

5. Quality of Care Delivered in Sub-acute Services

- Inferences relating to the quality of sub-acute care will be assessed primarily through an analysis of time series data on changes in mortality patterns, as well as through data gathered in the aftercare survey and follow-up case studies.
- In summary, we feel it is significant to note that the approach recommended by GAO focuses on only one component of post-discharge aftercare; i.e., post-hospital use of formalized sub-acute services, such as SNFS and home health agencies. Noncovered and informal aspects of post-discharge care that will be obtained through the patient survey (such as patients' living arrangements and community support services) were not addressed.
- We feel that the viability of PPS depends, in part, upon proper discharge planning and access to a comprehensive range of services and thus it is vital that an aftercare study address this issue.
- In addition to the concerns already discussed, we feel that GAO's descriptions of relevant studies currently underway within HCFA, particularly that subset of studies related to the quality of care, should be rewritten to depict a clearer understanding of their intent. Attachment 2 [not reproduced in this report] provides suggested language describing these studies for inclusion in the final report.
- Additionally, GAO should be aware that HCFA is conducting an ongoing set of sophisticated studies using various multivariate methods (such as canonical correlation analysis) as a means of monitoring hospitals' quality of care. One aspect of those studies will be undertaken by the Peer Review Organizations in the upcoming contract cycle and will result in a series of pilot projects to evaluate the feasibility of acquisition of more detailed data on patient characteristics and on the process of care from the medical record to be linked to longitudinal HCFA data on outcomes.

## GAO's Response

This portion of the comments deals primarily with the intention of HHS to develop and implement a study of the substantive issues that are raised in our report. We are pleased that HHS has decided to devote some additional resources to studies in the area of post-hospital care. However, contrary to its assertion that this is an entirely new study, the description provided in HHS's comments seems to indicate that it draws in large part on two studies which we have discussed in this report, the ASPE feasibility study (p. 64), and the Northwest Oregon Health System Agency study (see p. 61). We have been following the progress of that work quite closely.

We cannot assess the adequacy of the aftercare study as a whole in meeting the criteria laid out in our report because there is as yet no written evaluation plan. As presented in the HHS comments, however, the aftercare study is unlikely to meet the criteria for developing attributive information we have developed in this report. The studies seem to be essentially descriptive in nature. Thus, while this work may provide additional information on the status of Medicare beneficiaries and services in the post-PPS environment, and may contribute to the development of measures of the need for or access to post-hospital care, the study components do not seem to be designed to address questions about how PPS may have contributed to the current state of post-hospital care.

## HHS Comments

### Attribution

- The final concerns we wish to raise about the GAO draft report relate to the concept of "attribution" and "attributive" studies. The GAO stresses the need for attributional studies based on careful evaluation of pre- and post-PPS data and recommends an "interrupted time series" methodology as an approach to determining PPS effects on post-hospital discharge outcomes.
- We believe that the concept of attribution is a difficult and subjective one to interpret when applied to observational, statistical studies such as those involving PPS effects on post-discharge utilization of services.
- In its strict sense, the term "attribution" is normally used to refer to research studies conducted under controlled laboratory conditions capable of discerning cause and effect relationships. Unlike controlled laboratory experiments, observational, statistical studies, such as the type recommended in the GAO report, are not typically characterized as

attributive because they do not precisely control for confounding (e.g., non-PPS) factors in determining cause and effect.

- Observational studies, we feel, vary in their attributive reliability, depending on the complexity of the problem being addressed and the sophistication of the statistical modeling techniques used. Observational studies must, therefore, be evaluated individually in determining how well they explain cause and effect. GAO's report does not appear to consider these complexities.
- Notwithstanding the issue of the feasibility of conducting sound attributional studies, there are trade-offs between studying a narrow range of issues for which pre-PPS baseline data exist against studying a broader range of relevant issues, even though pre-PPS data does not exist. In this case, for an understanding of access, quality and cost issues relating to post-hospital services, we believe it is necessary to undertake a comprehensive study of both formal and informal aftercare services, even though comparable PPS data will not be available for the range of informal services beneficiaries need and use after hospital care.

## GAO's Response

This concern raised by HHS relates to the inherent difficulty involved in developing statements about causal relationships in the absence of strict laboratory/experimental controls. They argue that the types of studies we propose "... are not typically characterized as attributive ..." and "...must, therefore, be evaluated individually in determining how well they explain cause and effect."

In our report, we devote many pages to discussions of the strengths and weaknesses of alternative approaches to attributive studies (see appendix IV, pp. 118 to 132) and to the specific strengths and weaknesses of the evaluation plan we recommend (see appendix V, pp. 134 to 139). We provide references to the evaluation literature in which these types of studies are, in fact, characterized as attributive (see pp. 136, 139). Finally, we discuss on pages 44 to 46 our view that each type of study must be evaluated individually to assess the degree to which valid inferences about cause and effect can be drawn. Moreover, HHS provides no strong arguments that the type of studies we recommended will not produce credible attributive information and no alternatives they feel are better. Therefore we continue to believe that the types of studies we have recommended should be conducted.

## HHS Comments

### GAO Recommendation

- That the Secretary of HHS direct the Administrator, HCFA, to expedite the completion of the Medicare Automated Data Retrieval System (MADRS) that will reorganize the Medicare Administrative data into a file which is better able to support research and evaluation activities than are the current files.

### Department Comment

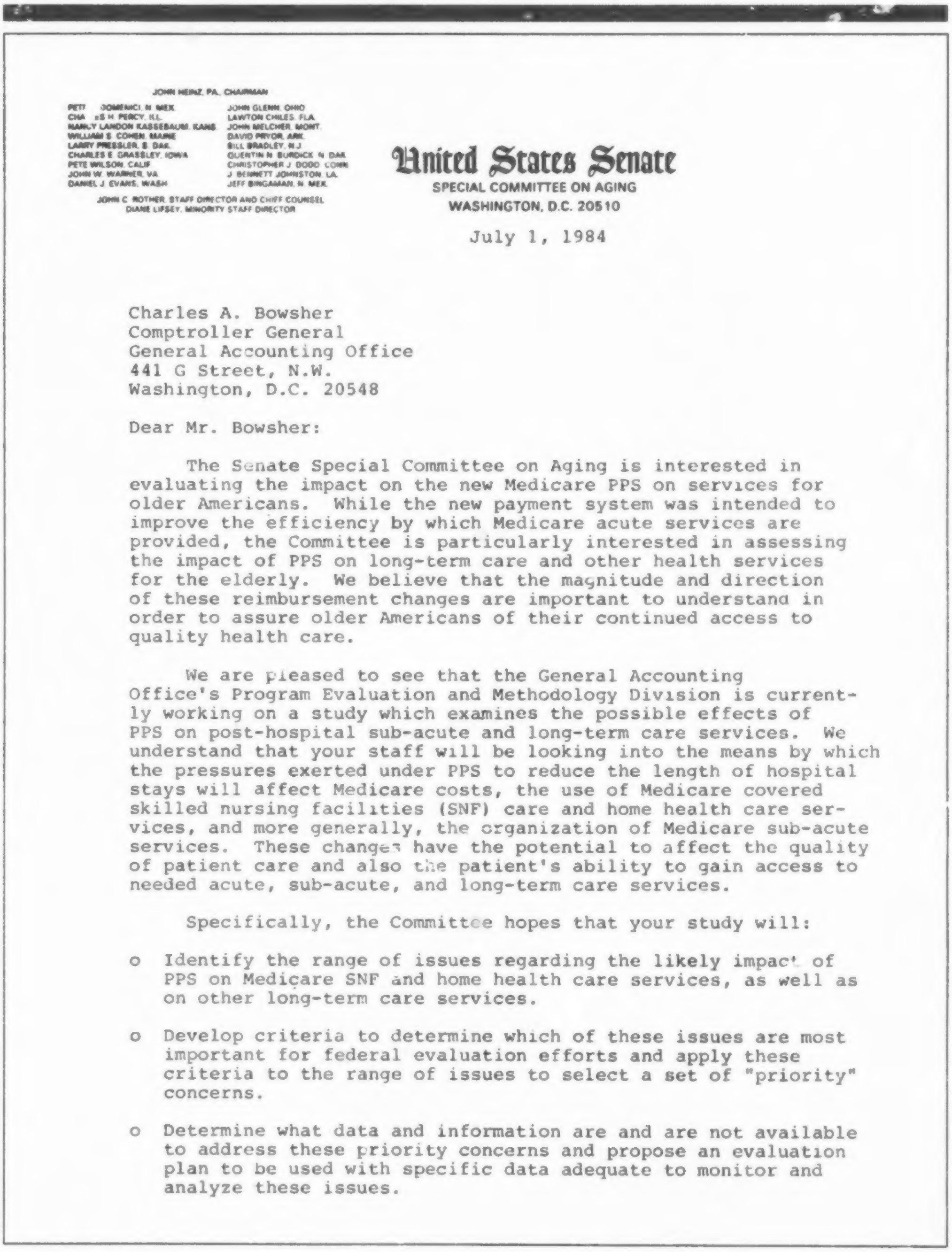
- With the assistance of a contractor, we are making progress on this project. However, because of the complexities and many aspects involved in evaluating PPS, MADRS cannot be the only vehicle used in resolving the data and research issues relating to the evaluation of PPS. We are working to ensure that appropriate data resources are identified and used.

## GAO's Response

We are pleased to hear that HHS is making progress on the MADRS project. We agree that it will not meet all of the data requirements for evaluating the effects of PPS. In fact, our report argues that many of the important issues cannot be addressed with Medicare administrative data and discusses some of the current HHS projects that promise to provide vehicles for addressing some of these other issues.

However, we do have a concern, based on recent information obtained from HCFA, that the MADRS project is not proceeding along the path originally proposed. In particular, we are concerned that Medicare data prior to 1982 will not be included in the system. This data is critical to adequate evaluations of the effects of PPS. Without it, the interrupted time-series studies we have recommended would be far more difficult to conduct; and more costly studies with less attributive power such as the nonequivalent control group studies might have to be substituted.

# Request Letter



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**United States Senate**
SPECIAL COMMITTEE ON AGING
WASHINGTON, D.C. 20510

July 1, 1984

Charles A. Bowsher
Comptroller General
General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Bowsher:

The Senate Special Committee on Aging is interested in evaluating the impact on the new Medicare PPS on services for older Americans. While the new payment system was intended to improve the efficiency by which Medicare acute services are provided, the Committee is particularly interested in assessing the impact of PPS on long-term care and other health services for the elderly. We believe that the magnitude and direction of these reimbursement changes are important to understand in order to assure older Americans of their continued access to quality health care.

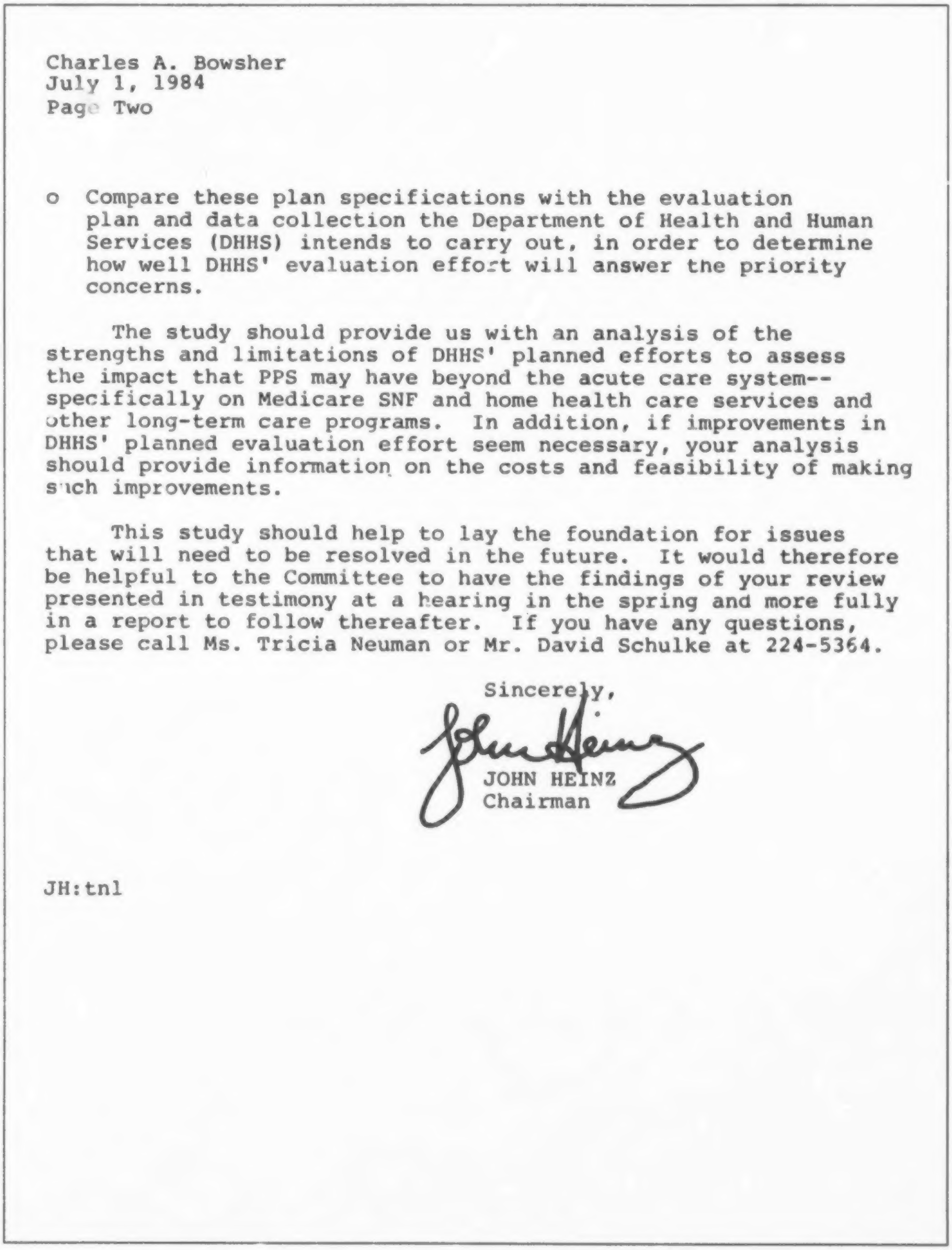
We are pleased to see that the General Accounting Office's Program Evaluation and Methodology Division is currently working on a study which examines the possible effects of PPS on post-hospital sub-acute and long-term care services. We understand that your staff will be looking into the means by which the pressures exerted under PPS to reduce the length of hospital stays will affect Medicare costs, the use of Medicare covered skilled nursing facilities (SNF) care and home health care services, and more generally, the organization of Medicare sub-acute services. These changes have the potential to affect the quality of patient care and also the patient's ability to gain access to needed acute, sub-acute, and long-term care services.

Specifically, the Committee hopes that your study will:

o Identify the range of issues regarding the likely impact of PPS on Medicare SNF and home health care services, as well as on other long-term care services.

o Develop criteria to determine which of these issues are most important for federal evaluation efforts and apply these criteria to the range of issues to select a set of "priority" concerns.

o Determine what data and information are and are not available to address these priority concerns and propose an evaluation plan to be used with specific data adequate to monitor and analyze these issues.



Charles A. Bowsher
July 1, 1984
Page Two

o Compare these plan specifications with the evaluation plan and data collection the Department of Health and Human Services (DHHS) intends to carry out, in order to determine how well DHHS' evaluation effort will answer the priority concerns.

The study should provide us with an analysis of the strengths and limitations of DHHS' planned efforts to assess the impact that PPS may have beyond the acute care system--specifically on Medicare SNF and home health care services and other long-term care programs. In addition, if improvements in DHHS' planned evaluation effort seem necessary, your analysis should provide information on the costs and feasibility of making such improvements.

This study should help to lay the foundation for issues that will need to be resolved in the future. It would therefore be helpful to the Committee to have the findings of your review presented in testimony at a hearing in the spring and more fully in a report to follow thereafter. If you have any questions, please call Ms. Tricia Neuman or Mr. David Schulke at 224-5364.

Sincerely,

John Heinz

JOHN HEINZ
Chairman

JH:tnl

Appendix II

# Medicare Services and Subacute Care

## Overview of Medicare-Covered Services

The population aged 65 and older accounted for about 11.7 percent of the total population in the United States in 1983, and almost all of this elderly population was covered by the Medicare program.[1] Certain disabled people are also eligible for Medicare. Medicare has two components, part A and part B services. Part A, the Hospital Insurance program covers hospital care, nursing home care in skilled nursing facilities (SNFs), home health care and several other facility-based services. Part A services are funded primarily through employer and worker payroll taxes and virtually all elderly are covered. Part B, the Supplementary Medical Insurance (SMI) program, covers physician services, outpatient hospital care, home health care, and other medical services and supplies. Part B is a voluntary program and enrollees pay a monthly premium, $15.50 in 1985. The premium covers only part of total costs.

Both parts of Medicare have limitations in payment policies and types of services covered and both require patient cost-sharing. Under part A, coverage of SNF care is limited to individuals who need skilled nursing care or rehabilitive services following a period of three or more days of hospitalization. In most cases, a maximum of 30 days may elapse between hospital discharge and SNF placement. Similarly, rehabilitative services are limited to persons who are expected to be "rehabilitated" and return to independent living. For covered SNF stays, Medicare requires no beneficiary copayments for the first 20 days. After the 20th day, the patient pays a daily copayment ($50.00 in 1985) for the next 80 days. There is a 100 day limit to SNF care in a benefit period.[2] After 100 days, the patient is completely responsible for any costs.

Under part A, payment for home health care is limited to situations where the patient has an acute condition. There is currently no copayment or deductible. Covered services are limited to people who are confined to their homes under the care of a physician and in need of part-time or intermittent skilled nursing care or physical or speech therapy. When provided in conjunction with skilled nursing care, home health aides, occupational therapy, medical supplies, and the use of medical equipment may also be covered.

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[1] Daniel R. Waldo and Helen C. Lazenby, "Demographic Characteristics and Health Care Use and Expenditures by the Aged in the United States: 1977-1984," Health Care Financing Review, 6:1 (Fall 1984), 15.

[2] A new benefit period begins after the beneficiary has not been hospitalized or in a SNF for 60 consecutive days.

These are current provisions. Many changes and adjustments have been made since the Medicare program began in 1966, including those instituted in the Social Security Act Amendments of 1983. There have been major changes in the way that both the SNF and the home health benefit have been defined. As discussed below, Medicare coverage of SNF services was more stringently administered after a surge in expenditures in the early 1970s. Medicare home health coverage, conversely, was made less restrictive when a requirement that coverage under part A be preceeded by a minimum of three days of hospital care and limited to a maximum of 100 visits were removed in 1981. (The Tax Equity and Fiscal Responsibility Act of 1982 authorized HHS to eliminate the 3-day prior hospitalization requirement for SNF services if the change would not increase total program costs, i.e., that decreases in the use of hospital services would offset increased SNF use and costs. This provision has not yet been implemented, and its implementation is not likely in the near future).

## Medicare Expenditures for Home Health and SNF Care

Relative to payments for hospital and physician care (about $43 billion and $15 billion, respectively, in 1984), Medicare spends little on either home health or SNF services for the elderly. SNF and home health care for the elderly together accounted for 4.0 percent of total Medicare benefit payments in 1984, $545 million and $1.90 billion respectively.[3] Prior to the implementation of PPS, Medicare's share of skilled nursing home care was about 4 percent of all public nursing home expenditures and its total SNF expenditures increased at a relatively slow pace. Reimbursements for SNF care grew at an annual compound rate of 0.1 percent from 1969 to 1980.[4] This low overall growth rate reflects policy intent. In reaction to Medicare SNF expenditures which greatly exceeded expectations, program administrators began, in the late 1960s, to insure that the restrictions on coverage were more strictly adhered to in practice.[5] In the immediate period before the implementation of PPS, however, Medicare benefit payments for SNF services increased at a noticably faster pace: the estimated average increase (not adjusted for inflation) in Medicare SNF payments was 10.1 percent from fiscal year 1982 to fiscal year 1983 and 9.0 percent from fiscal year 1983 to fiscal year 1984.[6]

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[3] U.S. Department of Health and Human Services, Report to Congress: The Impact of the Medicare Hospital Prospective Payment System, 1984 Annual Report (Washington, D.C.: November 1985), tables 10.2 and 10.8.

[4] Health Care Financing Administration, Medicare and Medicaid Data Book: 1983 (Baltimore, Md.: 1983), p. 38.

[5] Glenn R. Markus, Nursing Homes and the Congress: A Brief History of Developments and Issues (Washington, D.C.: Congressional Research Service, November 1, 1982), pp. 80-88; Judith Feder and William Scanlon, Medicare and Medicaid Patients' Access to Skilled Nursing Facilities (Washington, D.C.: Urban Institute, November 1981), pp. 14-15.

In contrast to nursing home care, Medicare is a major buyer of home health care, representing 81 percent of all public expenditures for this service in 1980.[7] Furthermore, reimbursements for home health services have been rising sharply—between 1969 and 1980 they grew at an average annual compound rate of 21.4 percent[8] and between 1980 and 1983 the annual compound rate of growth for Medicare home health service was approximately 26.4 percent.[9] Medicare benefit payments for home health care grew by an estimated 31.4 percent from fiscal year 1982 to fiscal year 1983, and by 22.8 percent from fiscal year 1983 to fiscal year 1984.[10]

Although the use rate (persons served per 1000 aged persons) for post-hospital subacute care had been increasing (at an average annual compound rate of over 15 percent per year from 1967 to 1982) prior to the implementation of PPS, relatively few Medicare patients used either SNF or home health services after they left the hospital. An analysis of all part A services for individuals' "hospital-related episodes of illness" was performed with 1976 data (see table II.1).[11] For 7.5 million episodes of illness, this study found that in only nine percent of the episodes were hospital stays followed by SNF and/or home health care. Patients who did use SNF or home health services after hospitalization had longer average lengths of stay in the hospital.[12] Likewise, the average total

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[6] HHS, Report to Congress: The Impact of the Medicare Hospital Prospective Payment System, 1984 Annual Report, table 10.4.

[7] U.S. General Accounting Office, Report on Federal Funding of Long-Term Care for the Elderly, GAO/HRD-83-60 (Washington, D.C.: June 15, 1983), pp. 9-10.

[8] HCFA, Medicare and Medicaid Data Book: 1983, p. 38.

[9] Pamela Doty, Korbin Liu, and Joshua Wiener, "An Overview of Long-term Care Services," Health Care Financing Review, 6:3 (Spring 1985), 73.

[10] HHS, Report to Congress: The Impact of the Medicare Hospital Prospective Payment System, 1984 Annual Report, table 10.4.

[11] Karen M. Young and Charles R. Fisher, "Medicare Episodes of Illness: A Study of Hospital, Skilled Nursing Facility and Home Health Agency Care," Health Care Financing Review, Fall 1980, p. 6.

[12] A study using a similar method for linking Medicare hospital, SNF and home health claims records into an episode of illness file for North Carolina beneficiaries in 1979 and 1980 also showed longer lengths of stay for patients eventually discharged to SNFs or home health care. (M. J. Connor and Sandra B. Greene, "Should Extended Care Following Hospitalization Be Encouraged?" Inquiry, 20 (Fall 1983), 258-63.)

Medicare charge was higher for those beneficiaries using post-hospital services.

**Table II.1: Types of Medicare Episodes, 1976**

| | Percent of episodes | Average hospital length of stay | Average charges per episode |
|---|---|---|---|
| Hospital only | 90.1 | 11.1 | $1,871 |
| Hospital and skilled nursing facility | 3.2 | 24.9 | $5,427 |
| Hospital and home health care | 5.2 | 22.9 | $4,610 |
| Hospital, skilled nursing facility, and home health care | 0.7 | 31.3 | $7,665 |

Source: Karen M. Young and Charles R. Fisher, "Medicare Episodes of Illness: A Study of Hospital, Skilled Nursing and Home Health Agency Care," Health Care Financing Review, Fall 1980, p. 6.

Appendix III

# Measurement and Data Issues in Evaluating the Effects of PPS on Post-Hospital Subacute Care

This appendix presents criteria for judging the adequacy of potential measures and the usefulness of alternative data sources relevant to the questions posed. We assess existing measures and data sources based on the criteria, and report for which questions the available measures and data will and will not suffice.

## Measurement Criteria

The five evaluation questions require an examination of change in five types of outcomes: (1) patients' condition at hospital discharge, (2) use of post-hospital services, (3) expenditures for those services, (4) access to post-hospital care, and (5) quality of post-hospital care. To answer these questions empirically, appropriate measures have to be identified or developed that adequately represent these outcomes. For example, the concept of patients' condition at hospital discharge could be measured by physical health, by patients' ability to take care of themselves, or both. Once proper measures have been identified, appropriate data for those measures can be sought for the set of individuals identified by the chosen design.

In some cases, the translation from concept to observable characteristic is fairly simple and direct. Numbers of home health visits and days in SNFs are examples of measures of utilization of post-hospital services. However, in other cases, the concept of interest may be so complicated that no single observation can adequately represent it. In those situations multiple pieces of information may be required, to be combined if possible to form an overall measure.

Measures need to meet certain criteria: feasibility, reliability, construct validity, and sensitivity. First we briefly describe these criteria. Then we assess the extent to which existing measures meet these criteria with respect to addressing the causal questions, and note where additional testing of these measures or the development of new measures would be necessary.

### Feasibility

Feasibility is defined here as the potential availability of the data required for a given measure. Measures would be infeasible if they depend on classes of information which had little or no likelihood of being found at any cost. The feasibility of different measures can vary if they call for different sources of data. For example, certain kinds of data can typically be found in a medical record, such as body temperature and blood pressure or medications administered. Other types of data generally require direct observation of the patient, such as assessing the patient's ability to perform specific tasks. Some of these items or measures may be routinely recorded in nursing notes, such as whether patients are ambulatory or eating independently. Others, such as patients' ability to dress or bathe are far less likely to have been collected or recorded in patient records.

For reasons outlined in chapter 3, we have determined that a strong assessment of the effect of PPS on post-hospital services will have to draw on data collected in the period before PPS took effect. Therefore, feasible measures would be those which could be applied using data recorded in some form at that time. These would include Medicare administrative records (particularly on questions of use and cost) and patient billing and medical records maintained by hospitals, physicians, or claims processing agents. Measures which require direct contact with a patient (e.g., for an interview or examination) or with someone currently caring for that patient (e.g., a nurse or physician) typically would not meet this feasibility criterion. However, it may be the case that sufficient observations (e.g., in nursing notes) have been recorded in medical records to enable the reconstruction of some of the measures typically requiring direct observation.

## Reliability

Reliability refers to the consistency with which a measure produces a given result or value under equivalent conditions, for example, in repeated applications to the same person (test-retest reliability), or in subjective judgments made by different coders (inter-rater reliability), when the construct of interest has not changed. The lack of such consistency reflects the effect of random errors of measurement. Random error can derive from a variety of sources, including variations in the way different people administer the measure, variations in the precise situation in which the measure is applied, and differences in separate instruments intended to provide equivalent results. All measures incorporate some error of this sort, but more reliable measures have less random error. Random error in measurement, if relatively large, tends to obscure patterns in the data under investigation, making it more difficult to find relationships among variables which do in fact exist. Therefore, measures with low reliability might not detect many real effects of PPS on the outcome of interest.

## Construct Validity

The validity criterion addresses the question of how well a measure represents what it purports to represent. In other words, how closely does variation in the measure among different cases correspond to differences among those cases in the attribute or condition that the measure attempts to characterize in observable form?

Validity is approached somewhat differently depending on the kind of generalization for which the measure will be used. For our purposes, the most relevant issue is the adequacy with which a measure characterizes a construct of interest. Measures of constructs necessarily build from observations of discrete examples of the varied behaviors or conditions which are thought to make up the construct. For example, measures, like number of home health visits, which relate directly to a single observable characteristic have intrinsic construct validity. However, when the measure is not related directly to an observable characteristic but to some concept or theory, its validity is open to question. If, under testing, it turns out that the different elements conceived of as relating to each other in some fashion do not in fact correlate empirically, a single valid construct has not been identified.

Construct validity depends first of all on the internal cohesiveness of the constituent elements of the construct as they are represented by the components of the measure (or measures) under study. A second test of construct validity is the consistency with which a potential measure relates to other variables or constructs in ways that accord with established theories on the relationship of the first construct to those variables. A measure which lacks or has low construct validity cannot be interpreted meaningfully, because there is no basis for presuming what the measure represents or describes.

## Sensitivity

Sensitivity refers to the responsiveness of a measure to a change or difference in the construct it represents. Sometimes the problem is one of scale, the increments of the measure may be too few or too widely spaced to register the actual variation among cases, as in measuring the weight of different pencils in tons. In the case of health outcomes, death rates may be insufficiently sensitive to detect changes in the quality of care; measuring complications or infections might be better insofar as they detect differences in situations where mortality rates remain constant. Sensitivity can also be affected by floor and ceiling effects. If the large majority within a group of interest already score very low on a measure, it will not be sensitive to decreased performance or activity on that scale. Thus, if only a handful of people over 65 did not wear eyeglasses, increased use of eyeglasses would not be a sensitive measure of declining visual acuity within this group.

Some measures reflect most strongly relatively stable differences among individuals rather than changes in individual performance. For example, in the case of assessing the health status of persons with chronic disabilities, much of the observed variation among cases derives from individual characteristics that are not affected by changes in policies or treatments. Measures which are characterized by a large amount of measurement error are also insensitive, in addition to being unreliable, for the same reason; fluctuations in values for individuals caused by error swamp real differences reflecting the effect of an intervention.

## Application of Criteria to Existing Measures

There are five basic outcomes where measurement of change due to PPS needs to be considered: 1) patient condition at the time of hospital discharge; 2) use of post-hospital services; 3) expenditures for these services; 4) access to post-hospital subacute care and 5) the quality of such care.

### Patient Condition at Time of Hospital Discharge

The factors determining health status at point of discharge could involve several different components. The first has to do with physical condition, such as blood pressure, temperature, respiration, etc. A second likely construct relates to the patient's need for subacute nursing or related medical care. A third involves social, psychological and economic circumstances determining the patient's ability to take care of him/herself or to obtain care outside of the hospital.

#### Physical Condition

Although measures exist which possibly could be used to measure the physical condition of Medicare patients at the time of hospital discharge (discussed below), we found few that have actually been used for that specific purpose, and none which have been extensively tested and validated for this use. Work on one scale which has been devised specifically for the purpose of measuring patients' condition at discharge is currently being done on a small-scale project in Oregon (see chapter 4). Medical utilization and peer review organizations do make assessments as to whether patients have been prematurely discharged from hospitals in certain limited circumstances, but the criteria they use in their determinations are not spelled out explicitly in the form of measures. Rather, those decisions are based on "local professional medical standards", which means to a large extent in practice the judgment of the reviewing physicians. The federal government has not prescribed any standards for appropriateness of hospital discharges.

Considerable work is currently being done in the area of developing and testing measures of the seriousness of Medicare patients' medical problems. Some of these measures rate the patient with respect to the entire course of a hospital episode (e.g., disease staging[1] , severity of illness scales[2] , patient management categories[3] ) while others are designed to assess patients upon admission to intensive care units (the Acute Physiology Scale[4] ) or other acute care facilities (e.g., MEDISGRPS[5] ) and at various stages of illness and recovery (e.g., the Functional Limitation Scale[6] ).

However, at least some experts involved in this effort have concluded that no scale can validly assess severity of condition across different types of illness (with the possible exception of patients in intensive care). The measures they have developed therefore relate more directly to appropriate levels of medical resources for treating particular medical conditions, instead of physical condition itself.[7]

Another possibility for measuring the need for continued hospital care would be the adaptation of techniques for measuring inappropriate hospital days. Since these techniques measure the need for hospital care, they are designed to monitor a patient's condition on a day-to-day basis. The Appropriateness Evaluation Protocol, for example, rates patients on twenty-seven objective criteria related to medical services, nursing and life support services and patient condition factors abstracted from nursing notes, physician notes and lab reports for the preceding day and the day reviewed. The scores are designed to identify inappropriate admissions or days of care.[8] It is conceivable that this type of instrument could be used for the opposite purpose, that is, to identify cases where patients in need of skilled medical care were discharged. The degree to which this type of instrument would be useful in determining the level of severity of patients' conditions at time of discharge would, however, have to be investigated before its usefulness for the purposes we are considering could be established. HCFA has awarded a contract to University Hospital, Inc., Boston to investigate extension of the protocol as a tool for measuring inappropriateness of medical care decisions.

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[1] Jonathan Conklin, Disease Staging and DRG Refinement (Bethesda, Md.: Systemetrics, January 31, 1985); Jonathan E. Conklin et al., "Disease Staging: Implications for Hospital Reimbursement and Management," Health Care Financing Review, annual supplement, November 1984, pp. 13-22.

[2] Susan D. Horn, Roger A. Horn, and Phoebe D. Sharkey, "The Severity of Illness Index as a Severity Adjustment to Diagnosis-Related Groups," Health Care Financing Review, annual supplement, November 1984, pp. 33-45; Susan Dadakis Horn, "Validity, Reliability and Implications of an Index of Inpatient Severity of Illness," Medical Care, 19:3 (1981), 354-62.

[3] Wanda W. Young, "Incorporating Severity of Illness and Comorbidity in Case-Mix Measurement," Health Care Financing Review, annual supplement, November 1984, pp. 23-31.

[4] William A. Knaus et al., "APACHE—Acute Physiology and Chronic Health Evaluation: A Physiologically-Based Classification System," Critical Care Medicine, 9:8 (1981), 591-97.

[5] Alan C. Brewster, Charles M. Jacobs, and Robert C. Bradbury, "Classifying Severity of Illness by Using Clinical Findings," Health Care Financing Review, annual supplement, November 1984, pp. 107-10.

[6] William J. Evans, C. Gene Cayten, and Paul A. Green, "Determining the Generalizability of Rating Scales in Clinical Settings," Medical Care, 19:12 (1981), 1211-20.

[7] Young, "Incorporating Severity of Illness and Comorbidity in Case-Mix Measurement," p. 29.

Therefore, it is uncertain as yet whether any of the existing severity indicators, or any potential new indicators, could be adapted to make effective use of the extensive information on test results and other clinical observations often contained in medical records in order to measure the physical condition of Medicare patients at discharge. Judgments about the appropriate use of these indicators would depend in part on an assessment of the reliability, construct validity, and sensitivity of candidate measures when applied to this particular category of patients. Although many of the measures discussed above have been tested for one or more of these properties, those results would not necessarily carry over to this application. In addition, the feasibility of drawing the requisite information from a sufficiently high proportion of pre-PPS medical records would determine whether any of these measures could be retrofitted for studies of the effect of PPS on Medicare patients' physical condition.

## Skilled Nursing Needs

The need for skilled nursing care, supervision, or other medical or medically-related care (e.g., physical therapy, speech therapy, etc.) as a construct is closely related to the Medicare program concept of conditions of coverage for post-hospital care. That is, the Medicare program only covers nursing home or home health care services for individuals who have need for skilled nursing or therapeutic follow-up care. The Medicare regulations set out criteria for determining coverage of services, but in practice these decisions reflect the interpretation of those regulations made by the fiscal intermediaries who process the Medicare claims, and the judgment of utilization review panels. For example, skilled nursing home care is covered if a patient is considered "unstable" or in need of monitoring. The determination of whether the patient is unstable is made on a case-by-case basis.

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[8] Paul M. Gertman and Joseph Restuccia, "The Appropriateness Evaluation Protocal: A Technique for Assessing Unnecessary Days of Hospital Care," Medical Care, 19:8 (August 1981), 855-71.

A problem with this approach for measurement concerns reliability. As in the case of reviews of the appropriateness of hospital discharges, local medical peer reviewers have to interpret written program criteria which may lead to variations in decisions about eligibility for coverage.[9] In addition, regulations governing coverage for services under Medicare have been changed, most significantly in the Omnibus Reconciliation Act of 1980 when the requirement that patients be hospitalized for three days prior to receiving home health care under Medicare part A was removed and the 100 visit limit was eliminated. Reimbursement and coverage criteria for the use of new technologies and medical devices and equipment have also been subject to reinterpretation and clarification by HCFA. As a result, the rate at which patients are qualifying for Medicare home health and SNF care is not a good indicator of their health status at time of discharge: patients who might qualify for SNF care in one area (under one fiscal intermediary) may not in another; patients who may not have qualified for coverage in the past may under revised HCFA regulations, while others who received Medicare services in the past may not be receiving these services currently.

Because the Medicare program regulations do not provide unambiguous criteria for identifying the need for skilled-level post-hospital care, other approaches to measurement need to be considered. A wide range of instruments have been developed to assess the need of elderly persons for skilled nursing or related care (e.g., the Cornell Medical Index[10], the Cumulative Illness Rating Scale[11] and the Rapid Disability Rating Scale[12]). Some of these instruments have been designed specifically for the purpose of determining whether elderly persons need to be placed in long-term care facilities and have been subjected to rigorous field testing and validation procedures (e.g., CARES[13], Evaluation of the Need for Care[14]). It is therefore possible that some of the instruments (or the scales upon which they are based) could be used to objectively measure Medicare patients' need for skilled care upon hospital discharge.

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[9] See, for example, Helen L. Smits, Judith Feder, and William Scanlon, "Medicare Coverage in Skilled Nursing Facilities: Variation in Interpretation," New England Journal of Medicine, 307 (September 30, 1982), 855-62.

[10] R. T. Monroe et al., "The Cornell Medical Index Questionnaire as a Measure of Health in Older People," Journal of Gerontology, 20 (1965), 18-22; Rosalie A. Kane and Robert L. Kane, Assessing the Elderly: A Practical Guide to Measurement (Lexington, Mass.: D.C. Heath, 1981).

[11] B. S. Linn, M. W. Linn, and L. Gurel, "Cumulative Illness Rating Scale," Journal of the American Geriatric Society, 16 (1968), 622-26.

[12] M. W. Linn, "A Rapid Disability Rating Scale," Journal of the American Geriatrics Society, 15 (1967), 211-14.

However, there are substantial reasons to doubt the construct validity of these measures for subacute post-hospital care. Many of the medically-oriented scales or indices developed to measure the need for long-term care are targeted to the chronically ill or impaired elderly, and not to the subacute care needs of Medicare patients recently discharged from a hospital. Thus we will not know, without additional testing, whether medical indices used to screen potential long-term care populations would serve as well to distinguish levels of care needed by the range of discharged Medicare patients. Assuming that a construct of general need for skilled nursing care were demonstrated, further work would be needed to establish that the selected measure or measures were reliable, sensitive, and feasible to use in retrospective studies when applied to Medicare patients just leaving the hospital.

## Functional Status

Patients who are not acutely ill do not, by definition, need acute care hospital services, and an important benefit of PPS is that it discourages excessive lengths of stay in hospitals. Many of the concerns raised about the possible negative effects of PPS relate to the discharge of elderly patients who, while they may not have needed acute care, were discharged either before they could take care of themselves adequately at home or without providing for needed non-medical services. It is not appropriate to attribute such problems to PPS, since they derive in large part from deficiencies in discharge planning or community-based and long-term care services. Nevertheless, PPS might exacerbate these problems by encouraging hospitals to discharge patients as soon as their acute medical needs have been met. Therefore, a construct which encompasses a more comprehensive notion of "ability to function without hospital care" warrants consideration.

The most familiar (and well-tested) measures related to this concept are a series of scales designed to measure individuals' abilities to perform the so-called Activities of Daily Living — ADLs — (feeding oneself, bathing, transferring from one place to another, toileting, and continence).[15] Scales designed to measure the Instrumental Activities of Daily Living — IADLs — indicate individuals' ability to perform those tasks that need to be done to get along alone at home (cooking, light cleaning, laundry, taking medications, using the telephone, and shopping).[16] In addition, there are a growing number of comprehensive instruments which include physical well-being indices, ADL and IADL scales, other scales and measures of mental and psychological status, and indicators of social support and community services which can be used to produce component and overall scores describing patients' need for services or ability to function adequately at home.[17]

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[13] Jeanne A. Teresi et al., "Construct Validity of Indicator-Scales Developed from the Comprehensive Assessment and Referral Evaluation Interview Schedule," Journal of Gerontology, 39:2 (1984), 147-57.

[14] Applied Management Sciences, Evaluation of Personal Care Organization and Other In-Home Alternatives to Nursing Home Care for the Elderly and Long-Term Disabled, interim report 4, rev., prepared for ASPE, HEW (Washington, D.C.: May 1, 1976).

However, all these measures have been developed and tested for use on the general nursing home population, whose characteristics in terms of the nature of patient dependencies and the types of services needed often varies substantially from those of patients just leaving the hospital requiring subacute care. As in the case of indices of physical condition and need for skilled nursing, the suitability of these measures for assessing the condition of Medicare patients at the time of hospital discharge has not yet been established. This would include assessing their reliability, construct validity, sensitivity, and feasibility for retrospective studies when applied to address this particular issue.

## Use of Post-Hospital Services

The measurement of patients' use of post-hospital subacute care services covered by Medicare is fairly straightforward. Basic measures are numbers of admissions to SNFs and home health agencies, days of care in

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[15] Long-Term Care Data Set, Technical Consultant Panel, A Summary and Critique of Selected Measures for Activities of Daily Living (Silver Spring, Md.: Applied Management Sciences, March 3, 1977); S. Katz and C. A. Akpom, "A Measure of Primary Sociobiological Functions," International Journal of Health Services, 6:3 (1976), 493-508; M. Powell Lawton and Elaine M. Brody, "Assessment of Older People: Self-Maintaining and Instrumental Activities of Daily Living," Gerontologist, 9 (1969), 179-86.

[16] Long-Term Care Data Set, Technical Consultant Panel, A Summary and Critique of Selected Measures for Activities of Daily Living, pp. 243-69.

[17] For example, Marilyn Bergner et al., "The Sickness Impact Profile: Development and Final Revision of a Health Status Measure," Medical Care, 19:8 (August 1981), 787-805; Duke University, Center for the Study of Aging and Human Development, Multidimensional Functional Assessment: The OARS Methodology, A Manual (Durham, N.C.: 1978); H. Grauer and F. Birnbom, "Geriatric Functional Rating Scale to Determine the Need for Institutional Care," Journal of the American Geriatric Society, 23 (1975), 472-76; A. W. Grogono and D. J. Woodgate, "Index for Measuring Health," The Lancet, November 6, 1971, pp. 1024-28; L. Gurel, M. W. Linn, and B. S. Linn, "A Physical and Mental Impairment-of-Function Evaluation in the Aged: The PAMIE," Journal of Gerontology, 27 (1972), 83-90; F. I. Mahoney and D. W. Barthel, "Functional Evaluation: The Barthel Index," Rehabilitation, 14 (1965), 61-65; Herbert A. Shoening et al., "Numerial Scoring of Self-Care Status of Patients," Archives of Physical Medicine and Rehabilitation, 46:9 (1965), 689-97.

SNFs or home health visits per case, the use of specific services (e.g., speech or physical therapy), and percent of hospital discharges going to SNF or home health. These measures are counts of discrete events recorded in Medicare administrative data. Therefore, to the extent that the analysis focuses only on services explicitly reimbursed by Medicare, their reliability should inherently be high. Likewise, the validity of individual measures of SNF and home health utilization follows largely by definition, although the extent to which different variants of utilization (e.g., SNF days per hospital discharge and SNF days per 1000 beneficiaries) form a cohesive construct awaits empirical testing. So does the sensitivity of individual measures. The same properties should basically apply to measures of use of non-Medicare services, although their reliability is more likely to vary.

In sum, aside from potential uncertainties relating to the sensitivity of available measures, the primary barriers to measuring utilization of post-hospital services, especially those funded by Medicare, more likely derive from the quality of the data (discussed below) than from the characteristics of the measures themselves.

## Expenditures for Post-Hospital Services

There are many ways to define the construct of cost, each of which have implications for the interpretation of evaluation results. For the purpose of evaluating PPS effects, we define the term in this report to mean direct payments to providers by Medicare and other payers for services rendered. To avoid confusion, we use the term "expenditures" instead of cost throughout this report. We do not address the relationship of these payments to either the providers' cost or charges for services. While this definition eliminates some types of questions from the analysis (e.g., has PPS changed providers' costs?), it is the definition which is most relevant to the Medicare program because changes in actual program expenditures will ultimately determine whether PPS is successful as a cost containment reform.

When costs are defined as direct payments for services, many possible measurement problems are eliminated. Assuming that the payer keeps records of all disbursements or that the provider keeps accurate records of receipts, valid and reliable measures of payments can be obtained. Nor is the sensitivity of the measure likely to arise; increases in expenditures are apparant when measured in dollars and cents. However, in the case of part A services, measures geared to individual patient bills would not be sensitive to interventions that only affected the year-end cost accounting made by providers.

One critical threat to adequate measurement for answering specific questions is that the record may not contain enough information to calculate the payment amount for a particular unit of analysis. For example, the records may allow for the construction of payments per month per provider but not payments per patient. Similarly, it may be possible to obtain costs per patient from a particular data source but not possible to determine what those payments were for, without using additional data sources. Thus, the ability to apply measures of the cost of post-hospital long-term care services, like those relating to use, is primarily limited by the availability and organization of data, rather than problems related to the properties of the measures themselves.

## Access to Post-Hospital Care

While there is a common understanding of what is meant by the concept of access to care, there are no direct measures of access that are generally accepted by health researchers. In part this reflects the inability to separate the measurement of access from related concepts such as need for care, supply of service and demand for care. In part it also reflects the difficulties involved in measuring an event that "does not occur" (e.g., not getting into a nursing home).

One potential measure of access to post-hospital subacute care for Medicare patients is the number of days that patients must wait in the hospital for admission to skilled nursing homes. However, there are significant limitations to the validity of such a measure when applied to both the pre- and post-PPS periods. Specifically, prior to the introduction of PPS, legislation was passed (but never implemented) under which hospitals could be reimbursed (at a lower rate) for care to Medicare patients who no longer needed acute care but who did need skilled nursing, when no SNF beds were available. These were known as "alternative placement days". Therefore, in theory the number of days that hospitals received payment for providing SNF level services could be used as a measure of access to SNFs in the pre-PPS period. However, utilization review boards varied substantially in the determinations they made when patients no longer required acute as opposed to skilled nursing care, and it is likely that many patients waiting for beds in SNFs were not identified by Medicare.

Under PPS, administrative days are relevant only in qualifying a small minority of cases for "outlier" status with higher reimbursement. For the large majority of cases hospitals receive no additional reimbursement for providing skilled nursing care. Thus, the meaning of this measure would differ pre- and post-PPS.

A more direct way of measuring access problems would be through surveys of patients, discharge planners, or patient advocates (e.g., ombudsmen). Because we need to measure change, however, the measure would be quite vulnerable to recall error about events long past or simple lack of information, both on the part of patients concerning efforts toward placement in post-hospital care made on their behalf, and on the part of discharge planners regarding arrangements made after the patient left the hospital. For purposes of obtaining descriptions of more or less contemporary events, and assuming that a full range of knowledgeable participants or observers to the process of securing post-hospital care was contacted, there should be no particular problem in developing a survey instrument which would yield reliable, valid, and sensitive information. However, it would still be limited on the feasibility dimension to the post-PPS period.

In the absence of good direct measures of access to health care in general, health researchers have developed proxy measures which could be considered for post-hospital care as well. One is "potential" access, which simply represents the presence of service providers.[18] If there are no Medicare-certified nursing home beds in an area, this indicates that access problems are likely. Similarly, a rapid growth in the number of home health agencies and the number of nurses employed in those agencies may indicate greater availability of services, increased market competition, etc. Clearly such inferences presuppose that increased supply results in increased access, which may be problematic with regard to long-term care (e.g., if demand is growing faster than supply).

A second type of proxy measure for access to care is "realized access", or actual use of services.[19] If more people use a service, more people have gained access to that service. This type of measure may be useful in indicating gross changes in the availability of services, and in comparing rates of use for similar populations under different structural conditions known to affect the availability of services, e.g., state regulatory restrictions on nursing home construction. Thus, if one found that rates of SNF admissions for Medicare patients rose substantially in states where new construction of nursing home beds was not restricted, but in other states with strict restrictions on new building comparable patients showed no such increase, that would suggest possible access problems in the latter group of states. However, in the field of long-term care, the relationship between use of services, the need for services, and the availability of services is poorly understood[20], so that the construct validity of use as a proxy for access is questionable at this point.

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[18] LuAnn Aday, Ronald Anderson, and Gretchen V. Fleming, Health Care in the U.S. (Beverly Hills, Calif.: Sage Publications, 1980), pp. 47-96.

[19] Aday, Health Care in the U.S., pp. 99-184.

## Quality of Long-Term Care

Measurement of the quality of care administered to Medicare patients in SNFs and by home health agencies is confounded by two related problems. First, the state-of-the-art in measuring the quality of health care in general, and long-term care in particular, is not well developed.[21] Second, Medicare SNF and home health post-hospital care span two distinct components of the health care system: acute and long-term care providers. Medicare post-hospital care is provided in long-term care settings, but they are not long-term care services. Rather, they are relatively short-term subacute services. The work that has been done to develop measures of the quality of care in hospitals does not generally extend to post-hospital care, while measurement of quality in long-term care settings is often designed to address the special characteristics of long-term care patients, i.e., the chronic, frequently irreversible nature of conditions affecting the frail elderly and disabled persons.

Outcome measures in evaluations of the quality of long-term care services present major problems of construct validity and sensitivity. The most widely accepted are mortality rates and rates of readmission to hospitals or other medical care facilities. Both can provide general indications of serious quality problems in acute care, and may indicate problems in post-hospital care as well. However, both have relatively low sensitivity. Patients can experience significant problems of pain, delayed recovery, or emotional trauma without dying or returning to the hospital. Moreover, neither offers unambiguous evidence of low quality of care, since intermittent hospitalizations, complications, or death frequently result from the natural course of severe or terminal illness or from comorbidities, even when the hospital and post-hospital care provided is of high quality. To the extent that the elderly suffer disproportionately from more severe illnesses, this threat to construct validity would apply even more strongly to Medicare patients. Therefore, global measures such as mortality and readmission rates need to be interpreted cautiously, perhaps in terms of specific types of conditions or patients. It is also possible to break these measures down into time periods of different duration as well as diagnosis, which may help to decrease variation in patient outcomes not associated with differences in quality of care.

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[20] U.S. General Accounting Office, Medicaid and Nursing Home Care: Cost Increases and the Need for Services Are Creating Problems for the States and the Elderly, GAO/IPE-84-1 (Washington, D.C.: October 21, 1983), pp. 15-18.

[21] Avedis Donabedian, Explorations in Quality Assesssment and Monitoring, vol. 3, The Methods and Findings of Quality Assessment and Monitoring: An Illustrated Analysis (Ann Arbor, Mich.: Health Administration Press, 1985); William E. McAuliffe, "Measuring the Quality of Medical Care: Process Versus Outcome," Health and Society, 57:1 (1979), 907-30.

Other measures of quality exist, some of which may provide greater sensitivity to variations in treatment. Measures of essentially three different constructs of quality have been pursued, to varying stages of development. These are structural measures of quality in long-term care (e.g., human, material and organizational resources), process measures of care (procedures, activities, and the resources expended), and outcome measures (as indicated by disease, discomfort, disability, death, etc.). The relationships among these constructs is not well established.[22] Work on the development of process and outcome measures in long-term care is proceeding (see chapter 4). The variation in long-term care patients' needs and potential for recovery, however, may effectively preclude the use of objective outcome measures which can be applied to large-scale administrative data files. In that case, process and structural measures may provide useful though partial indicators of quality of care.

## Factors Affecting the Usefulness of Alternative Data Sources

As discussed in the section on measure feasibility, the restriction to retrospective designs means that data for observations prior to PPS must come from data sources collected before its implementation. Conceivably, specific measures may themselves have been recorded, e.g., Activities of Daily Living (ADL) scores in medical records. However, unless collected at precisely the right time point, such as at the time of hospital discharge for patient condition measures, these measures may still not be usable for the study of PPS effects. For the most part, the measures would have to be applied retrospectively based on data elements recorded in billing files or medical records for other purposes. Thus, days of care could be calculated from admission and discharge dates, while patient condition measures might possibly be abstracted from nurses' notes describing patient activities and manifested problems.

In this section we discuss four factors that influence the usefulness of any source of data. These are: 1) the degree to which access to the data is restricted, 2) the cost of collecting the data and recording it in usable form, 3) the extent to which data are missing or incomplete, and 4) the magnitude and distribution of error or incorrect information in the data.

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[22] Bettina D. Kurowski and Peter W. Shaughnessey, "The Measurement and Assurance of Quality," in Ronald J. Vogel and Hans C. Palmer (eds.), Long-Term Care: Perspectives from Research and Demonstrations (Washington, D.C.: U.S. Government Printing Office, 1983), pp. 104-15.

## Access

A number of different access problems are likely to apply for data relevant to assessing the effect of PPS on post-hospital subacute care. One issue concerns the willingness of agencies administering a program such as Medicare to make program data available to researchers and others outside the agency for their own analyses. Secondly, efforts to protect personal privacy may lead either program administrators or health providers to restrict access to medical records. Finally, for analyses incorporating comparisons across time, access may be prevented if records are lost or destroyed after a certain period of time. Potential problems with access to records do not, of course, apply to HCFA research, because the agency has legal authority to obtain Medicare (and Medicaid) records.

## Cost

Even if data are available, they may be very costly to collect. For example, if the required data are widely dispersed among a large number of sites, data collection will be more costly than if the data were centralized in one location. Similarly, data which already exist in machine-readable form (e.g., computer tapes) are more readily obtained and used than data which are recorded in manual files. However, even computerized files can be expensive to analyze if they are large and/or require extensive manipulation to address questions of interest. Manual files are particularly expensive to process if the data they contain have not been entered in a standardized fashion (e.g., most medical records). In that case, any large-scale analysis will require an elaborate abstracting procedure to convert the data to a standardized format where the same items are recorded in terms of consistent definitions and categories.

## Completeness

Data sources also vary in the completeness of the information they contain. Thus, for each data element, information will be missing for a certain proportion of cases. The larger the proportion of cases with missing data on a given item, the lower the confidence that any results based on the cases will have information accurately reflecting the entire group.

### Accuracy

Some proportion of the data elements which are not missing will be inaccurate. Error can either be random or systematic. Random error, if relatively large, tends to obscure patterns in the data, making it more difficult to find relationships among variables which exist. Systematic error, on the other hand, distorts those patterns and, if large, can lead to finding relationships which in fact do not exist as well as missing those which do. Reliability checks and verification procedures are generally required to assess the level of random and systematic error characterizing specific data elements within different data sources.

## Sources of Data on PPS Effects on Post-Hospital Care

Evaluating the effects of PPS on post-hospital care calls for data from a range of sources which fall into three broad categories: 1) data collected in the course of administering a particular program (e.g., Medicare, Medicaid); 2) survey data collected through interviews with individual patients or providers; and 3) data collected through direct observation of patients or similar observations recorded in the patient's medical record. In the discussion below, we briefly describe and assess the major sources of these types of data on Medicare and long-term care which might be useful in addressing the Committee's questions.

### Medicare Administrative Data

A large body of data on services provided to Medicare beneficiaries and expenditures made on their behalf has been recorded in Medicare's administrative data systems since the program began in 1966. Data are available on individual beneficiaries relating to number and cost (to both Medicare and the beneficiary) of SNF days covered by Medicare as well as the total cost of various ancillary services provided. For home health care, patient level data are collected on the number of visits paid for and their cost divided into eight service types: skilled nursing care, physical therapy, speech therapy, occupational therapy, medical social services, home health aide, other, and additional other. These cost and use data can be matched with demographic and other information characterizing the beneficiary, financial and organizational data on the provider, as well as information on the associated hospitalization, if any.

#### Access to Data

Access to the basic patient billing files for SNF and home health care, and the Medicare/Medicaid Automated Certification System (MMACS) data, is largely limited to HCFA staff, other government agencies, and HCFA grantees and contractors. The information in the files is considered confidential and its release is subject to the provisions of the Privacy Act and other federal regulations. The public use version of the Medicare

Provider Analysis and Review (MEDPAR) records, which includes selected data fields from a 20 percent sample of inpatient hospital stay records for Medicare enrollees from 1980 through 1982, and which was used in developing the original DRG payment system, is readily available to outside researchers but only contains information on acute hospital stays. The inpatient hospital patient bill file (Patbill) which contains 100 percent of Medicare inpatient hospital bills beginning in 1983 (replacing the 20 percent MEDPAR file) does provide unverified information on discharge destination, including transfers to SNFs and home health care, beginning in 1984. In our field work, we found reason to doubt the credibility of discharge destination information and do not recommend its use in evaluations.

## Cost of Using the Data

The basic Medicare data are initially recorded in weekly files which combine all types of bills (inpatient, SNF, outpatient, home health, physician, and other Part B) for each beneficiary. To use these data for analysis of Medicare expenditures for individual beneficiaries requires sorting and merging of all the weekly files in the period of interest. Since these files comprise approximately 42 million part A and 150 million Part B records per year, the cost of such individual level analysis using the basic billing data is high.

The data processing costs of analyzing these data can be reduced by using various summary files generated by HCFA from the basic weekly billings files. However, these files generally contain less detailed information on the use and cost of specific post-hospital services, and frequently are not available for recent years. For example, the Medicare History Sample has been completed only through 1982 and provides only limited information on home health care services (aggregate home health visits and costs per year). Moreover, most of the beneficiaries represented in the history sample do not have a hospitalization in a given year, and most of those with a hospital stay do not use home health or SNF services following hospitalization, so that the five percent sample may not be large enough to make reliable estimates of changes in the use of post-hospital care for subgroups of the beneficiary population.

HAINURO (Infrequent Users Retrieval Output) brings together summaries of separate part A bills for all Medicare beneficiaries beginning in 1978 and is updated continually. However, it lacks information on types of services provided, and bill records may not be complete for six months or more after they are initially processed. Although less massive than the basic weekly billing files and already sorted according to beneficiary identification numbers, the file can only be used to retrieve individual patients' data based on their Medicare number without additional programming. Thus additional programming would be required to convert the separate bills assembled in HAINURO to the type of data needed for the time series designs discussed in chapter 3.

A new data file that HCFA has under development, the Medicare Automated Data Retrieval System (MADRS) file, is intended to have a fairly similar structure, but would include part B bills as well as more detailed information on part A services. As discussed below (appendix V), this file would greatly facilitate the construction of time series data, particularly time series which combined hospital data with post-hospital SNF and home health data for individual beneficiaries. Inclusion of part B data would also allow analysts to include part B home health (under the Supplementary Medical Insurance program) and durable medical equipment bills in their analyses of post-hospital care. Extensive tape file indices are planned that would facilitate obtaining data for specific individuals, geographic areas, and providers.

Two other summary files, termed stay-record files, relevant to post-hospital subacute care focus separately on SNF and home health services. One file consolidates data for all SNF stays in a given year and another includes data from 40 percent of all home health claims. These summary files contain somewhat less detailed information on cost and use of post-hospital services than the basic weekly files, but they permit much more efficient analysis of individual records. However, an examination of all types of Medicare funded post-hospital long-term care would require matching across these data files as well as with hospital stay files and other files.

### Completeness and Accuracy

All Medicare billings submitted for payment undergo computer checks for completeness, internal consistency and conformity with policies and regulations (e.g., whether a given service is covered by Medicare). Quality control procedures maintained by the Health Care Financing Administration monitor the consistency with which the fiscal intermediaries and carriers perform these checks as well as the overall accuracy of the system in reimbursing appropriate amounts for services eligible for Medicare coverage. However, HCFA apparently does not maintain records showing the amount of incompleteness or inaccuracy found for particular data elements in the course of these quality control operations.

Some data elements play a particularly important role in determining Medicare's financial obligations and these therefore tend to receive a higher level of scrutiny. Items relating to days of care fall into this category, because basic Medicare coverage is limited to 90 days of hospitalization (60 days without copayments) and 100 days of skilled nursing care (20 days without copayments) per episode of illness. Other items relating to specific services rendered and charges applied are less critical to HCFA, at least for those part A services not part of the prospective payment system (including SNFs and most home health care). This is because the ultimate payment that HCFA makes to each provider is determined by a year-end accounting of cumulative approved costs associated with all Medicare patients, and is not derived from the bills for individual patients submitted throughout the year. Those individual bills do play an important role in that interim payments to the providers are based on them, but final program expenditures should not reflect any errors that might have appeared in those bills.

The results of the few studies we identified which have looked at the accuracy of the Medicare Statistical System (MSS) are generally consistent with this description. One widely cited study was conducted by the Institute of Medicine in 1977 in which hospital medical records were compared to the Medicare records for a sample of patients.[23] It found that information in the MSS on a patient's diagnoses and the procedures performed frequently did not accord with the patient's original medical record, but for such items as the patient's sex and dates of admission and discharge there was near perfect agreement. Other studies have corroborated the unreliability of diagnostic and procedure data in the Medicare system prior to the introduction of PPS.[24] The accuracy of this information for acute hospital care is expected to be much greater under PPS, since reimbursement for such care now depends on the DRG (diagnostic related group) to which each patient is assigned, and that in turn depends most heavily on the patient's diagnosis and the procedures administered.

The SNF and home health billing files described above are constructed from the interim billings submitted by providers for interim payment.

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[23] Institute of Medicine, Reliability of Medicare Hospital Discharge Records (Washington, D.C.: National Academy of Sciences, November 1977).

[24] Linda K. Demlo and Paul M. Campbell, "Improving Hospital Discharge Data: Lessons Learned from the National Hospital Discharge Survey," Medical Care, 19:10 (October 1981), 995-1005; Cynthia Barnard and Truman Esmond, "DRG-Based Reimbursement: The Use of Concurrent and Retrospective Clinical Data," Medical Care, 19:11 (November 1981), 1071-82; Richard F. Corn, "Quality Control of Hospital Discharge Data," Medical Care, 18:4 (April 1980), 416-26.

Any corrections brought about by the computer editing procedures of HCFA and the fiscal intermediaries would be reflected in these data. However, any discrepancy of the actual program expenditures as determined through the audited year-end cost reports of providers from the aggregate of reimbursed charges shown on the individual patient bills would not be taken into account. HCFA was unable to provide us with any information on the amount that cumulative interim payments to part A providers exceed or fall short of final program expeditures as determined in the year-end cost accounting. Therefore, using patient billing files to track program expenditures introduces an additional element of uncertainty which does not apply for data on utilization such as days in a SNF or number of home health visits of various types.

Additional complications in using Medicare administrative data for comparisons across time arise when the items being recorded change in definition or meaning (see the earlier discussion on construct validity). The main example of this relevant to the evaluation questions highlighted in this report was an expansion of coverage for reimbursement under Medicare home health benefits in 1980. Therefore, some portion of the increase in home health services provided since that date reflects this broadening of coverage rather than an increase in the specific home health activities measured prior to 1980.

We have not independently verified the accuracy of the Medicare Statistical System data over time. Appendix V includes an assessment of the probable accuracy of key data elements, given what is known from the Institute of Medicine study, of the reliability of Medicare hospital discharge abstract data and what can be presumed from knowledge of HCFA's bill processing and quality control procedures.

## Relation to Designs

Medicare program data on use and cost of Medicare-covered SNF and home health services have been collected since the inception of the program although it is only readily available for more recent years (e.g., HAINURO currently begins with 1978 data). The data can also be used to investigate readmissions and mortality rates, which are frequently selected as indicators of quality of care. The data, while not currently structured as time series data, could be converted into time series with appropriate programming. The most suitable database currently available is HAINURO, although MADRS, if it were available, would be better since it would be more complete. In addition, because the retrospective nonequivalent control group design is actually an abbreviated time series design, it could also be used with the Medicare program data.

However, some data elements appear to vary in accuracy or definition between the pre- and post-PPS periods, particularly the diagnostic codes, but also, to a lesser extent, or home health services and program expenditures for post-hospital services. The larger these discrepancies or uncertainties, the more problematic becomes the use of these data elements in either time series or nonequivalent control group designs. Appendix V discusses in greater detail the implications of these data quality issues for time series and nonequivalent control group designs.

## Facility-Level Medicare Data

While the primary outcomes of concern in this report will need to be addressed through data related to individual Medicare beneficiaries, we will briefly review two facility-based data sources which could be of value in assessing and in helping to explain changes in post-hospital care services.

### The Provider of Service (POS) Files

Data about hospitals, home health agencies, SNFs, independent laboratories and other medical facilities certified for participation in the Medicare program are recorded in the POS files, which are updated as certification/recertification data are received. A history file is also maintained. Data on this file include facility address, type of ownership (private, proprietary, government-owned), number of beds, services offered, types of staff, etc. Provider numbers can be linked with the provider numbers on individual billing records.

### Medicare/Medicaid Automated Certification System (MMACS)

The data supplied to the POS file is developed from the MMACS system, which contains information on facilities participating in the Medicaid and/or Medicare programs. Facility data, as in the POS, include type of facility ownership, facility size (beds), staffing information (including staffing ratios), etc. MMACS also records information obtained in the survey and certification system, including facility deficiencies discovered during surveys. The system is used primarily to track deficiencies in facilities, and to verify facility certification for Medicare and Medicaid billing. The on-line data system developed from MMACS is the Rapid Data Retrieval System, which is generated on a monthly basis. This system can be used to respond to inquiries, develop data for studies, monitor facility workloads, identify problem or deficiency reports, etc.

While the Medicare/Medicaid Automated Certification System contains a great deal of information, variations in the survey and certification processes within and among the states seriously limit the validity of data on deficiency citations recorded in the system. In addition, some problems have developed with duplication of bed counts resulting from separate certification for Medicaid and Medicare nursing home beds. The other data elements in this file, however, have not been reported to have similar limitations.

## Peer Review Organizations

Much of the responsibility for monitoring hospitals and the quality of care they furnish to Medicare beneficiaries under PPS has been assigned to the 54 Peer Review Organizations (PROs). Each of the PROs is responsible for a certain geographic area, usually a state. Reports submitted by the PROs to HCFA on the reviews that they carry out should provide useful information relevant to the effects of PPS. However, the specific way in which PROs are required to perform this oversight sharply limits the usefulness of these data for tracking post-hospital outcomes for the Medicare program on a national basis.

In terms of the issues raised in this report, one crucial limitation is the restriction of PRO review activities (under the terms of their original contracts) to inpatient hospital care. Thus they have had no role in assessing the quality of care provided in post-hospital settings such as SNFs or home health agencies. For the same reason they have had no occasion to collect data on access to post-hospital subacute care, or the cost and use of such services. That leaves patient condition at hospital discharge as the only issue where PROs could have data of relevance to post-hospital care.

The main thrust of PRO reviews focuses on the appropriateness of hospital admissions. This reflects a concern that under the incentives created by PPS, some hospitals might attempt to increase their revenues by admitting patients with questionable need for inpatient care. Patient condition at discharge becomes a relevant consideration from this perspective in terms of hospital readmissions which are caused by premature discharges. Thus, reduction in unnecessary readmissions owing to substandard care is one of the five quality objectives that all of the PROs were obliged to adopt.

The PROs were initially required to review all cases where the patient was readmitted to a hospital within seven days of discharge from a prior hospitalization. The Peer Review Organization Manual published by HCFA indicates that the specific types of premature discharges that PROs are to review are those that result in the subsequent readmission of the patient to the same hospital, or readmission of a patient to a hospital for care that could have been provided during the first admission.[25] Thus, only readmissions to the same hospital are subject to mandatory review. The review period is to be increased to 15 days in the PRO contracts awarded for 1986. PRO review could lead to a variety of findings—inappropriate admission for the second hospitalization, readmission for legitimate reasons, or readmission that was needed because of inappropriate or poor quality care during the first hospitalization including insufficient inpatient recuperation, i.e., premature discharge. PROs do not routinely disaggregate these reasons in reports to HCFA. Consequently, summary statistics on numbers of readmissions within seven days and reimbursements approved or denied would not provide information on patient condition at discharge. PRO reviews also would miss readmissions after the specified day limit and admissions to other acute care hospitals, at least some of which may reflect problems in access or quality of care.

The specific goals set for each of the PROs within the main quality issues were negotiated individually between the PRO and HCFA. Therefore, where the PROs have agreed to specific numerical goals for decreases in readmissions due to premature discharges, data on progress in meeting that goal will be submitted to HCFA. Otherwise, probably the only feasible source for such information is the reports that the PROs are supposed to submit to HCFA regional offices describing individual cases where evidence of premature discharge was found.

An additional complication is the judgmental nature of all such determinations. PROs act primarily on the basis of typical patterns of medical practice in their geographic area, as perceived by individual physician reviewers. As discussed above with reference to PRO determinations of needs for skilled nursing care, it is likely that there would be substantial variations in the way that different reviewers in different PROs evaluated cases in terms of premature discharges. Thus, regional differences in patient condition based on PRO findings could reflect standards of medical practice rather than the effect of PPS.

In short, although PROs have an important role in monitoring the effects of PPS on the quality of inpatient hospital care, they currently do not consider four of the five outcomes identified as significant for PPS effects on post-hospital subacute care. With respect to the fifth outcome, patient condition at hospital discharge, some information may exist, but it is likely to be fragmentary and inconsistent across different geographic areas. As a result, the PROs are not set up to produce useable data on patient condition at discharge for the Medicare program as a whole.

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[25] Health Care Financing Administration, "Peer Review Organization Manual," transmittal 5, Washington, D.C., August 1985, pp. 3-5.

## Other Federal Long-Term Care Program Data

Medicaid and community-based services account for the bulk of federal expenditures for long-term care services. As noted above, compared to Medicare, Medicaid provides a far larger amount of federal financial support for long-term care, particularly nursing home care. Other federal funds contribute to a range of non-institutional services, including some forms of home health care, which are collectively referred to as community-based services. The federal contribution comes primarily in the form of block grants and Older Americans Act programs that states typically pass on to a wide range of local governments and service agencies. Because of this, there are no uniform program records for tracking cost, utilization, or quality of care of community-based services on an individual basis and little systematic data at any other level of aggregation (e.g., state or national level). Medicaid program data on individuals exist primarily in non-uniform, sometimes manual data bases maintained by the states. The data that HCFA routinely collects are compilations of aggregate totals that the states have submitted on a monthly (HCFA Form 120) and annual basis (HCFA Form 2082). While these data might be used in the time series design, generalizations would be limited because the data are not broken down sufficiently to allow the analyst to examine changes in the use and cost of particular services separately for the elderly and non-elderly populations.

HCFA does have under development the Medicaid tape-to-tape system which is intended to create a uniform computerized data base of all Medicaid beneficiary records in five states: California, Georgia, Michigan, New York, and Tennessee. Medicaid tape-to-tape will provide data beginning with 1980 which are comparable to those available for Medicare SNF and home health services, but only for those five states. Even though these states account for approximately 40 percent of all Medicaid expenditures, the wide variation among state Medicaid programs and the fact that New York used its own version of prospective payment up to 1986 precludes making generalizations to the national population on the basis of these data when they become available. However, the data could be used in the same ways as the Medicare data to answer the questions about the effects of PPS on Medicaid use and expenditures.

## National Survey Data

Although Medicare collects information about copayments and deductibles charged to its beneficiaries, data on any other out-of-pocket expenses have to come from surveys of those individuals. Two surveys conducted in recent years could provide some useful baseline data on individual out-of-pocket expenses prior to the implementation of PPS. The National Medical Care Expenditures Survey (NMCES) administered by the National Center for Health Services Research collected a wide range of data on health care utilization, cost, and insurance coverage from a sample of 40,000 people in 1977-78. The National Medical Care Utilization and Expenditure Survey (NMCUES) of the National Center for Health Statistics collected similar information from 17,900 respondents in 1980.

The main disadvantage with both surveys for our purposes is that their samples were drawn to be representative of the national non-institutionalized population, thereby excluding residents of nursing homes. NMCUES and NMCES also excluded short-term nursing home or other subacute health care facility stays by sampled individuals from their analysis. Data on home health services were included under descriptions of "medical provider visits" in both surveys. However, the type of home visit (e.g., skilled nursing visits as opposed to visits by home health aides, or therapists, or physicians), and the payment sources for these visits are weak in both as well.

The data assembled by NMCES and NMCUES are available through low cost public access tapes to any interested researcher. With respect to completeness and accuracy, the NMCES data have undergone extensive verification. Much of the information provided by the individual survey respondents on utilization, cost and insurance coverage was confirmed through supplementary surveys of the respondents' health care providers, employers and insurance companies. In the NMCUES survey, data on utilization and cost for Medicare and Medicaid eligibles were checked against program records for those individuals.

Any analysis of changes in post-hospital subacute care financed by Medicare beneficiaries themselves would require that data be collected in the post-PPS period that were comparable to that assembled in NMCES and/or NMCUES. So far no such survey has taken place. The National Center for Health Services Research, HCFA, and the National Center for Health Statistics are currently developing plans for a new National Medical Expenditure Survey (NMES). Unlike the previous national medical care expenditures studies, NMES will include an institutional survey component, and extensive data on the use of all forms of subacute and long-term care. The elderly will be oversampled to allow better estimates of their use of health care services including post-hospital care. This will provide estimates of total expenditures by payment source for individuals' entire episodes of illness. However, NMES is not scheduled to be implemented until 1987. The long time gap between NMES and NMCES / NMCUES and the lack of any means for determining what would have happened in the absence of PPS will seriously limit any efforts to determine the role of PPS in causing changes which may have occurred since the previous surveys.

## Facility/Medical Records

For many outcomes such as patient condition at time of hospital discharge, quality of, and access to post-hospital long-term care which are not routinely recorded in administrative records, medical records of patients and related information maintained by providers represent the primary source of data. Most of this information exists in the form of manual records. Such records often follow general conventions on content and terminology but usually with no fixed format. Some of these data, particularly for acute hospital care, are reproduced in a more standardized and frequently machine readable form through such sources as hospital record abstracts and insurance claim files. Examples of the kind of information likely to be found in the more standardized sources are diagnoses and procedures reported by means of various coding systems.

### Access to Data

Obtaining access to medical and related records can be a difficult and uncertain process for evaluators. While hospitals and long-term care providers are required by law or program regulations to retain the medical records of their patients, they are also obliged by law to protect the privacy of their patients by restricting access to those records. Researchers who wish to draw information from medical records generally have to obtain voluntary cooperation from the hospital or other providers to do so. In addition to convincing the provider of the usefulness of the study, it is usually necessary to demonstrate how the confidentiality of the records will be maintained. In many cases, this also complicates the linking of the medical record information with information from other sources such as Medicare program data.

However, HHS, PROs, and claims processing agents have a legal right to obtain the medical records of all Medicare patients. Therefore, research sponsored by HHS would not encounter thse problems. Other researchers examining Medicare-related issues can minimize these access problems by contracting with PROs to abstract needed data from samples of Medicare patients.

## Cost of Using the Data

Three primary factors affect the cost of using medical record and related data: 1) the extent to which the data are physically dispersed; 2) the extent to which the data are recorded in a standard format; and 3) the extent to which the data are stored in machine-readable form. Data which have already been abstracted will usually be less expensive to process because they tend to be standardized, machine-readable, and relatively centralized. However, many types of information will only be found in the original patient records. Those typically are scattered among diverse providers, necessitating numerous site visits to obtain a nationally representative sample. This, together with the prevalence of manual records and largely unstandardized formats, makes the analysis of such data potentially quite expensive. In this situation, a trained reader will have to extract the desired information from a possibly voluminous file of documents for each case. Elaborate procedures will often have to be developed and monitored to assure the validity and reliability of any coding decisions made.

## Completeness and Accuracy

Relatively little research has been done on the completeness and accuracy of medical records. The work that has been undertaken suggests great variability in content and quality. Hospital records generally are better than those for ambulatory care, particularly for items included in uniform hospital abstracting systems such as the Professional Activity Study (PAS).[26] Nonetheless, tests of abstracting accuracy from the original medical record reveal relatively low reliability for some items, particularly diagnoses and procedures, while for items such as admission and discharge dates the reliability of the abstracted data is quite high. Moreover, hospital records themselves often lack a substantial number of basic items. One study of long-term care providers also found large variation in the content and reliability of information in their medical records.[27] In short, while medical records as a whole contain large amounts of information, researchers drawing on data from medical records will need to assess the completeness and accuracy of the specific items from the particular records they are using in order to have some assurance of the quality of those data.

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[26] John W. Williamson, Assessing and Improving Health Care Outcomes: The Health Accounting Approach to Quality Assurance (Cambridge, Mass.: Ballinger, 1978), p. 87.

[27] U.S. Department of Health and Human Services, National Center for Health Statistics, Evaluation of the Long-term Care Minimum Data Set, executive summary (Hyattsville, Md.: February 1982), pp. 5-6.

## Relation to Designs

In order to use data abstracted from medical records to answer the Committee's questions, samples of patients would have be drawn at times before and after the implementation of PPS and their records abstracted in a standardized way. While there is no theoretical reason why sufficient data could not be developed to permit time series studies, the number of records which would have to be abstracted makes such a study expensive. Indeed, to abstract enough medical records to support the retrospective nonequivalent control group design is likely to be quite costly.

Appendix IV

# Design Approaches

## Introduction

Answering descriptive questions about what is happening in post-hospital care now is relatively easy; determining whether PPS caused any changes in the outcomes is subject to considerable disagreement. Some HHS officials indicated to us that they feel it may not be possible or feasible to provide this information. We believe that it is, although more conclusively for some outcomes than others. We therefore focus in this discussion on methods for validly and reliably attributing changes in post-hospital subacute care outcomes to PPS.[1] This discussion forms the framework for our assessment of the adequacy of the evaluation approaches being used by HHS. We begin by identifying what we mean by PPS and by the effects of PPS. We then discuss criteria by which the adequacy of various approaches can be judged and how they will be applied in our analysis. Finally, we describe a number of different approaches and discuss how well they meet our two primary criteria. We conclude that there are two general approaches which meet the two primary criteria and could be used, given appropriate measures and data (see appendix III), to produce the information needed.

## Formulation of PPS as a Causal Event

In designing studies to investigate the effects of PPS on post-hospital subacute care outcomes as discussed in chapter 1, this report treats PPS as a policy intervention which can be divided into two components: 1) the passage of legislation in April 1983 (Social Security Amendments of 1983; Public Law 98-21) outlining a system of prospective reimbursement for Medicare payments to hospitals and; 2) the formal implementation of prospective payments to individual hospitals beginning in October 1983. Some important changes in provider behavior could have been made between the passage of the legislation and its implementation in individual hospitals which would affect long-term care outcomes (see Chapter 2). In addition, an evaluation design should be sensitive to the possibility that TEFRA may also have resulted in changes similar to those expected from PPS. The ability to identify the effects of TEFRA and anticipation of PPS and separate them from each other and the effects associated with the formal implementation is one of the more difficult problems in designing evaluations of the effects of PPS. For example, a study with "pre" data that falls between passage and formal implementation could seriously underestimate the total effect of PPS.

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[1] The discussion of study design alternatives presented here is developed from concepts discussed in Quasi-experimentation: Design and Analysis Issues for Field Settings by Thomas D. Cook and Donald T. Campbell (Chicago, Ill.: Rand McNally, 1979).

In addition, our review of design options will focus on approaches for identifying aggregate effects. By aggregate effects we mean the presence and magnitude of a change in an outcome which can be attributed to PPS, independent of all other changes. This approach can be distinguished from an approach which attempts to develop a numerical estimate of the importance of each of the factors (including PPS) that produce change in an outcome or to identify the degree of influence of specific intermediate changes (e.g., in hospital behavior; see chapter 2) that account for the observed outcome.

We feel that the approach based on aggregate effects is preferable for three reasons. First, it is a logical first step toward understanding how and why PPS had these effects. Second, the information on aggregate effects can help to focus subsequent analyses of relative influence, saving time and money. Finally, the intent of PPS as stated in the legislation was to reduce the rate of increase in total Medicare costs while maintaining an acceptable level of quality of care. If PPS does this well, identifying the relative weights of additional factors may be of academic, rather than practical, interest. The studies discussed below would provide initial answers as to whether these objectives have been achieved as a result of PPS.

However, working from this aggregate-effects definition entails some risks. The principal one is that the final estimate may include separate effects which tend to counterbalance each other, revealing little or no change overall. For example, increased need for SNF care may be offset by a lack of access to SNF beds, leading to a finding of little or no increase in the use of SNF services. Should this occur for an outcome where some effect was expected, that outcome would be an excellent candidate for further study using a design which disaggregates the effects of PPS relative to other factors.

## Criteria for Assessing Alternative Designs for Evaluating the Effects of PPS

In the following sections, we lay out a set of criteria which are important to consider in selecting from among several alternative approaches or designs for evaluating the effects of PPS. We discuss tradeoffs among the criteria and propose a set of priorities for applying the criteria to alternative designs.

## Description of Criteria

### Criterion 1: Feasibility

Feasibility, as used here, means whether a particular design could be used to answer a question, given unlimited time and resources. It is not being used to describe practicality, reasonableness or cost-efficiency. In some cases, the situation will not allow a design to be employed. For example, if the intervention has already been implemented for all eligible participants, such as PPS has been, a design which prospectively assigned participants to either receive or not receive the intervention would not be feasible. On the other hand, using existing medical records to gather information on the effects of that intervention might be time consuming, costly and present a number of privacy and confidentiality issues but would be theoretically possible, and therefore, for the purpose here, feasible.

### Criterion 2: Statistical Validity

Meeting this criterion involves ensuring that the study is sensitive enough to detect a relationship if one exists (statistical power) and that the probability that the observed relationship is due to chance is suitably low (significance level). Once we have determined that a relationship exists between the presumed cause and measured effect, we will often be interested in estimating the magnitude of the relationship. It is also useful in interpreting the magnitude estimate to provide confidence intervals (i.e., upper and lower bounds within which the population value will fall a specific percentage of the time).

There are a number of potential threats to making valid inferences that a statistical relationship exists. Some derive from the data collection and measurement strategies used. For example, small sample sizes, measures with low reliability, and the use of statistical techniques with low detection power may result in an incorrect conclusion that no relationship exists, i.e., false negatives. It would be easy to reject the hypothesis that PPS was associated with a change in access to care by using samples which were too small, heterogeneous groups of subjects, or unreliable measures of access.

Elements of the design itself also play a role. For example, treatments which are not standardized across subjects increase the variability among subjects and increase error variance, making false negatives more likely and increasing uncertainty. The use of appropriate statistical techniques and methods for reducing "error" variance (e.g., partitioning the analysis into groups of subjects which received equivalent treatments and using reliable measures) help reduce these threats.

## Criterion 3: Internal Validity

Establishing the validity of a causal attribution entails three steps: demonstrating that the presence of the cause results in an alteration in the level of the outcome of interest relative to its level when the cause is not present; demonstrating that the direction of the causal relationship is from one variable (e.g., PPS) to the other (e.g., change in access to care); and demonstrating that there are no plausible alternative explanations of a relationship between PPS and the outcome.

First, there must be evidence that the level of the outcome covaries with the presence or absence of the presumed causal agent. Statistical tests are the typical method for assessing if there is covariation between the hypothesized cause and the effect. Second, the direction of the relationship must be from the expected cause to the expected effect. The relative timing of the changes in the cause and effect serves as one basic test of this. In evaluations conducted after an intervention such as PPS begins, the specific timing of implementation of the intervention must be known in order to be certain that measurements taken at a particular point in time either preceded or followed the intervention.

Finally, the evaluation has to rule out alternative explanations for the change in the outcome or at least to show their implausibility. The means of ruling out potential alternative explanations are of two basic types: methodological and statistical. Methodological approaches involve structuring the evaluation design to limit the likelihood of particular alternative explanations and using the pattern of observed results to rule out others on logical grounds. For example, in a study of the effect of PPS on patient condition at discharge from the hospital, the evaluator might want to match pre- and post-PPS patients on age prior to comparing them in order to rule out the possibility that increased patient age, and not PPS, might account for changes in condition at discharge. Ruling out alternative explanations on logical grounds refers to comparing the observed pattern of results to prior knowledge about the expected pattern of results. For example, if the evaluator expected that the increased numbers of frail elderly would lead to changes in discharge condition and comparison of discharge condition changes for Medicare patients of different ages did not show the expected pattern of results, the plausibility of increases in frail elderly as an explanation for overall changes in outcomes would be lower.

Statistical approaches rely on models (derived theoretically and/or empirically) of the specific relationships among a set of presumed causal variables, including the treatment, and the outcome. The models may be quite simple (e.g., an analysis of variance) or very complex (e.g., simultaneous equation models of the health care system). What the models share in common is that they use information on variables other than the outcome of interest to control for the influence of factors other than the treatment on the outcome. For example, the effect of age on outcomes both pre- and post-PPS could be removed statistically, and the "residual" outcomes tested for PPS effects. These statistical approaches should be used in conjunction with methodological approaches.

## Criterion 4: Generalizability

Generalizability means that the results obtained in a particular evaluation can be applied to broader categories of persons and circumstances. Where there is reason to believe, as chapter 2 showed, that the effects of PPS may vary considerably, generalizability requires either studying the whole population or using systematic procedures to select representative samples of the particular subgroups of interest which are large enough to detect the anticipated effects within preset limits of error.

## Criterion 5: Explanation

Once an effect of the treatment has been established, we will often want to know the answers to a variety of additional questions. What components of the treatment are responsible for the effect? What other factors account for changes in the effects which are not related to the treatment? Does the magnitude of the effect depend on characteristics of the subjects (e.g., age or sex), settings (e.g., region of the country), or other factors (e.g., regulatory climate)? Did PRO reviews influence outcomes? All of these questions imply some form of additional explanation which may either be addressed in the design of a particular study or investigated in separate studies.

Studies of the effects of PPS which are based on nationally-representative samples of beneficiaries provide many opportunities for analyses of subgroups of beneficiaries based on factors such as age, place of residence and other demographic factors. To the extent that these demographic factors can be associated with other information (e.g., place of residence with information on nursing home availability, state Medicaid long-term care policy and "toughness" of CON regulation of health resources), additional explanatory analyses can be conducted.

## Criterion 6: Providing Results on a Timely Basis

Most evaluators would agree that studies should not be undertaken if no results will be available before the decisions they are intended to inform have been made. There is, however, substantial disagreement about the extent to which the methodological adequacy of studies should be sacrificed in order to produce results on a more timely basis. We note that designs and measures which are inadequate for answering one kind of question (e.g., whether PPS caused problems in long-term health care) may be adequate for answering another kind of question (e.g., what is happening now, regardless of what caused it). As we have indicated earlier, however, the latter information provides substantially less guidance in making program improvements.

In our opinion, the likely consequences of making an error based on less than adequate information should determine the study approach adopted. The larger and more costly the program, and the stronger the possibility that harm could come to program participants through actions based on inadequate information, the less acceptable become the risks of relying on methodologically weak studies. In the case of evaluations of the effects of PPS on post-hospital care, we believe the potential effects on beneficiaries as well as on program costs mean that weaker studies generally should not be substituted for stronger ones simply because they can produce results more quickly. Nonetheless, it can be advantageous to obtain preliminary information through quicker but less rigorous studies while awaiting the outcome of studies based on stronger designs for demonstrating causal relationships.

## Criterion 7: Minimize Overall Costs

The final criterion is that the costs and burdens of new evaluations should be minimized to the extent possible, consistent with obtaining adequate answers to the evaluation questions. Careful planning, including specification of the questions, choice of a design which meets (but does not greatly exceed) the needs of the study and calculation of the necessary sample sizes, can help keep costs in step with the scope and importance of the evaluation question.

One of the most costly aspects of conducting any evaluation is that involved with developing data collection instruments, obtaining the necessary approvals to use them (e.g., OMB clearance), going out and collecting the information, and editing and organizing the data prior to analysis. Collecting new data directly from program participants and getting them ready for analysis is more time consuming and costly than having data already available on computer tapes which are "clean." New data collection also creates a greater burden on program administrators and participants than using already available data. In a time of limited federal resources, available data should be used if they are adequate to address the question being asked. However, the price of using inadequate data—that is, obtaining uninterpretable or misleading results—may outweigh the price of new data collection. As we have discussed in appendix III, the Medicare program collects a great deal of use and expenditure data in the routine administration of the program which are also used for evaluative purposes.

## Tradeoffs Among Criteria and Relative Importance

Fully satisfying some criteria often means losses in others. In some cases, an increase in internal validity and/or statistical sensitivity will be at the expense of generalizability. For example, enhancing sensitivity by increasing similarity of people being compared pre- and post-PPS would tend to decrease generalizability.

There are also clear tradeoffs between the methodological criteria and two practical criteria, timeliness and cost. With regard to timeliness, trying to produce timely results may mean restricting the evaluation to readily available subjects (with decreased generalizability), reanalyzing previously collected data (with potential losses in statistical sensitivity and/or internal validity), or selecting a less adequate but more quickly completed study design. With regard to cost, in order to save money, the evaluator might reduce the number of sites or subjects and narrow the study's scope. If both time and cost are of the essence, one might decrease sample size (potential threat to statistical sensitivity), eliminate a control group or other design component (potential threat to internal validity), or stop data collection prior to a final post test.

In our view, the priority ordering of the methodological criteria for evaluations of studies of the effects of PPS is feasibility, internal validity, statistical validity, generalizability, and explanation. While the same ordering may be reasonable in other situations, we are not making such a general statement. The placement of feasibility first is clear; a design which cannot be implemented would not be useful. The reason for the rankings of the remaining criteria is that the key initial question of interest to the Committee was whether a particular outcome has been affected by the introduction of PPS. This argues for the primacy of internal validity followed closely by statistical validity. Once a set of approaches which meet the feasibility and internal validity criteria is identified, choices among them can be made on the basis of trade-offs among the other criteria.

## Description of General Design Options

The available design options range from prospective field experiments through retrospective quasi-experiments (e.g., interrupted time series and nonequivalent control group quasi-experiments) to non-experiments (e.g., pretest-posttest noncomparative designs, case studies and posttest-only designs). Before evaluating specific alternatives against the criteria, a brief description of the basic features of each design will be given in the context of PPS. In each case, the features of the design which determine its internal validity will be discussed because of the priority given to that criterion.

### Prospective Field Experiments

If PPS had been tested before it was implemented nationally, a nationally representative sample of hospitals could have been drawn. Then some hospitals might have been randomly assigned to implement PPS and others selected at random to continue the previous cost reimbursement system (i.e., a prospective randomized field experiment). Such a design would permit strong conclusions that any observed differences in patient condition, costs, utilization, access and quality of long-term care were the result of PPS because the groups of hospitals should be equivalent in all relevant ways except for implementing PPS.

The primary difference between this design and the prospective nonequivalent control group design is that, with the latter, the hospitals would not have been randomly assigned to groups but allowed to self-select themselves into the PPS implementation, with some or all of the remaining hospitals assigned to the group continuing the cost reimbursement system. While attribution of cause is weaker, if the evaluator knows on what variables the self-selected PPS hospitals differ from the cost reimbursement hospitals, statistical adjustments can be made for these differences.

### Interrupted Time-Series

The simple interrupted time-series looks at the pattern of changes in an outcome measure over a long period of time before PPS was implemented and compares them to the pattern of changes after implementation. Since long-term trends such as general increases in the number of frail elderly would already be reflected in the time series, the effect of PPS in addition to these trends can be established. Only events which change at the same time PPS was implemented, or changes in how the outcomes were measured at the time of PPS, could be alternate explanations of the shift in outcomes.

The simple interrupted time-series can be enhanced by splitting the national population of hospitals into separate time-series based on when the individual hospitals began formally receiving prospective payments (i.e., an augmented interrupted time series). This adds additional assurance that one-time concurrent changes other than PPS can be ruled out. It does not increase the validity of conclusions about either TEFRA effects or effects occuring between the passage of PPS and its formal implementation.

## Retrospective Design Options

These design options represent efforts to reconstruct comparisons of PPS and non-PPS conditions after the fact. One approach would compare outcomes for patients discharged from the same hospital before PPS was implemented and after it was implemented, to outcomes from the same time period for other hospitals who did not implement PPS during that period (termed a retrospective nonequivalent control group design). The evaluator tries to obtain information that permits assessment of equivalence of the two groups of hospitals and statistically control for any apparent nonequivalence. However, the statistical models which are used to adjust for nonequivalence have to be constructed after the fact, and their adequacy is often difficult to establish.

A second retrospective design option, the retrospective natural variation design, takes hospitals and divides them into subgroups on the basis of variation in the extent to which the treatment was implemented. Although PPS is formally identical across hospitals, some experts have argued that groups of hospitals can be identified based on the extent to which they have to respond to PPS. If these groups appear to be responding differentially to PPS in a manner consistent with the experts' predictions, confidence that PPS caused the differential response is increased.

Finally, an augmented retrospective nonequivalent control group design would add to the simple retrospective nonequivalent control group design several features designed to strengthen its internal validity. First, it has two independent replications of treatment-control comparison. Second, it uses strategies designed to reduce error variance and thereby increase the statistical sensitivity. Finally, it uses additional pretest and posttest observations to extend the internal validity of the conclusions.

### Pre-PPS/Post-PPS Designs

These designs would simply compare outcomes immediately before PPS and immediately after PPS for a group of hospitals (i.e., retrospective pretest-posttest design). It provides no basis for estimating what change would have occurred in the absence of PPS (since there are no controls for trends or concurrent events) and thus permits only the conclusion that a change has occurred.

One situation in which acceptable causal inference may be possible with a pre/post design is where there are well-established hypotheses about what chain of events would lead to a specific outcome. If the chain of events can be measured, and a structural model relating those events to the outcomes can be developed, causality may be established (i.e., an augmented retrospective pretest-posttest design).

### Case Studies

Case studies would involve obtaining in-depth, longitudinal information about selected hospitals before, during, and after implementation of PPS. Under certain circumstances, case studies can provide moderately strong evidence of causality within a given institutional setting, particularly when grounded in well-established theory. However, this requires extensive data collection in the period preceding the intervention, which is now infeasible given that PPS has been implemented across the country. In addition, case studies are generally inappropriate where a great deal of variability is expected.

### Post-Test Only Studies

In this approach, the five outcomes of interest would be observed in a sample of hospitals after PPS was implemented. While offering useful descriptive information on present conditions, the design does not answer questions about change or rule out alternative explanations of reasons for the present conditions.

## Application of the Criteria to Identify Appropriate Designs for Studies of the Effects of PPS

Table IV.1 displays the eleven designs for evaluating the effects of PPS that have just been described and illustrates how we chose among them based on the criteria presented earlier. In the first column, we present our judgment about the feasibility of implementing the particular design in an evaluation of PPS. For designs judged to be feasible, we make judgments about the internal validity of the individual designs. These judgments are meant to allow the reader to see which designs we believe are generally better or worse than others for demonstrating the effects of PPS. In a particular application, an individual study design may be better or worse than the general rating. For those designs which we judge to be adequate for evaluating the effects of PPS, we provide ratings on each of the remaining criteria.

**Table IV.1: Ratings of Eleven Design Options on Selected Criteria**

| | Methodological criteria | | | | | Practical criteria | |
|---|---|---|---|---|---|---|---|
| **Design options** | **Feasible** | **Internal validity** | **Statistical validity** | **Generalizability** | **Explanation** | **Time to results** | **Overall cost** |
| Prospective randomized field experiment | no | | | | | | |
| Prospective NECG[a] design | no | | | | | | |
| Simple interrupted time series design | yes | high | high | often high | no | short | low |
| Augmented interrupted time series design | yes | high | high | often high | possible | short | low |
| Retrospective NECG design | yes | low | | | | | |
| Augmented retrospective NECG design | yes | moderate | moderate | often limited | possible | long | high |
| Retrospective natural variations design | yes | low[b] | | | | | |
| Retrospective pretest-posttest design | yes | very low | | | | | |
| Augmented retrospective pretest-posttest design | yes | low[c] | | | | | |
| Case study | no | | | | | | |
| Posttest-only studies | yes | none | | | | | |

[a] Nonequivalent control group

[b] Because of the nature of PPS as a treatment, this design would not be as internally valid in this situation as it might be in others.

[c] The lack of a good theoretical model of the post-hospital environment makes this approach low in internal validity. In other situations, the approach may be appropriate.

### Application of the Feasibility Criterion

The way in which PPS was implemented and the organizational responses of hospitals and other health providers to PPS have created a policy context that limits the design approaches which now can be applied in investigating the effects of PPS. For example, studies that would take a prospective approach, such as randomized experiments or prospective nonequivalent control group designs, are not feasible for reasons outlined below. As a result, any study of the effects of PPS, including its effects on post-hospital care, will necessarily rely on data derived from the period before PPS came into effect (i.e., retrospective data).

Prospective studies of the effects of PPS are not feasible because there is no way to recreate either "anticipation" of the shift to Medicare PPS or its formal implementation. Although the date on which hospitals came under the PPS system varied by as much as eleven months, since October 1984 all acute care nonfederal hospitals in the United States (except a limited number of rural "sole community providers") have received reimbursement from Medicare on a prospective basis. While the amount hospitals are paid per DRG varies, based on an averaging of national and hospital-based costs phased in over a four-year transitional period, the prospective nature of the payment does not. Those states with waivers from the Medicare DRG system have their own prospective payment systems which limit Medicare payments as well. With the exception of a few "outlier" cases, hospitals receive a fixed sum per Medicare patient admission with a given diagnosis, regardless of the amount of services provided and days spent in the hospital. Thus PPS already applies to virtually all hospitals and all Medicare cases.

While it is too late to experiment with the implementation of the national DRG/PPS system, in theory it would be possible to consider shifting some subset of hospitals back to retrospective cost-based payment. With careful collection of baseline data for a carefully selected sample of acute care hospitals and random assignment of some of those hospitals to return to cost-based reimbursement, one could construct a classic randomized experiment. However, even without considering all the issues related to the cost and feasibility of doing this, we do not believe that this approach would address the effects of implementing PPS. It would, instead, examine the effect of reinstating cost-based reimbursement once PPS had been in effect.

For example, to the extent that hospitals and other health providers have made numerous operational and organizational changes in response to the shift to PPS, it seems highly unlikely that all these changes could or would revert back to the pre-PPS situation for the subset of hospitals returned to a cost-based reimbursement system. These changes include, for hospitals, expansion and/or acquisition of nursing home and home health care services, widespread installation of new computerized accounting systems, a revamping of medical records processing, and a general tightening of management cost controls. Some hospitals have begun to formally review patterns of medical practice, such as their use of tests, and admissions and discharge procedures.

After being returned to cost-based reimbursement, the pressure on hospitals and physicians to pursue such changes might subside, but those changes already made are likely to remain in effect at least to some degree. These organizational and procedural changes are in turn likely to affect how a hospital would respond to future alterations in Medicare's reimbursement system. In short, experimental approaches could test the effects of changes in the current (PPS) system of reimbursement, including a shift back to cost-based reimbursement, but it is basically too late to apply these approaches to the question of what effect the original imposition of PPS has had on post-hospital services.

The case study is also infeasible in this situation. While it would be possible to do case studies which focused on the current situation in post-hospital subacute care (i.e., descriptive case studies), it would not be feasible to do longitudinal case studies because there is no way to adequately reconstruct what conditions were in individual cases prior to the implementation of PPS.

### Application of the Internal Validity Criterion

Based on our earlier discussion of the relative priorities to be given to our various criteria, designs which produce higher levels of internal validity should be preferred to those which produce lower levels. In Table IV.1, we present our opinion, for each of the feasible designs, of the likelihood that the design would yield a valid causal inference in an evaluation of the effects of PPS. While there is room for disagreement about both the ratings we have given the various designs and the minimum acceptable rating we have chosen, we believe that answering causal questions such as those posed by the Senate Special Committee on Aging require designs with at least a moderate level of internal validity.

In our opinion, time-series designs (both simple and augmented) are likely to result in valid causal inferences about the effects of PPS (see appendix V). One of the major factors which limits the internal validity of most other quasi-experimental designs is the possibility that there are systematic differences between the subjects who get the treatment and those who do not (termed "selection" differences). In fact, in most situations where the treatment is intended to ameliorate some problem, those who have relatively "more" of the problem usually are first to get the treatment. In time-series designs, these selection problems are less important because the comparison of interest is between pre- and post-treatment observations of the same or similar subjects rather than between totally different groups of subjects.

Second, the use of a long pretreatment baseline allows the evaluator to rule out a large number of alternative explanations (e.g., changes in the size of the elderly population; changes in the use of home health services; changes in nursing home bed supply; etc.). Assuming that the influence of these factors remains relatively constant across the pre- and post-PPS periods, their causal influence is already reflected in the changes over time in the baseline observations. Only factors which change in ways dissimilar to the pattern found in the pre-treatment period at (or near) the time of the intervention are potential alternative explanations for an observed effect occurring at the time the intervention occurred. For example, the relatively sudden drop in inflation during the early 1980s might be an important factor to consider in an analysis of program costs if the intervention of interest occurred in 1980-1982. Similarly, changes in medical technology which affected the use of home health services or revisions to Medicare or Medicaid reimbursement policies which coincided with the introduction of PPS would need to be taken into account. Finally, the long pretreatment baseline also allows one to investigate the possible anticipatory effects of the passage of PPS and, under certain conditions, to separate them from the effects occuring after formal implementation. The interpretation of results depends, however, on taking into account all major, relevant concurrent changes and on consistency of measurement over time.

In general, we believe that using the basic retrospective nonequivalent control group design is less likely to permit valid causal inferences because there are important trends over time in many of the outcomes which need to be taken into account and because there is limited information available on the selection factors operating in the situation. However, by augmenting the basic design (see appendix V), the internal validity can be increased, in our opinion, to the point that there is a moderate likelihood of obtaining valid causal inferences for outcomes that cannot be evaluated using time series approaches.

Because a number of experts in health services research have argued that studies of the differential responses of providers represent studies of the effects of PPS, we have chosen to discuss the "natural variations" approach here rather than under the criterion of feasibility. However, we would argue that there is no difference in the extent to which PPS applies either formally or in practice to different hospitals that would permit an analysis based on natural variations in the treatment itself. Investigations of the differential responses of providers to the incentives contained within PPS are important but only indirectly address the central questions posed in this report. This approach depends on the untested, but reasonable, assumption that providers with more to lose financially made greater responses to PPS with, presumably, larger effects on post-hospital care outcomes. However, it seems to us to be unreasonable to assume that providers whose net Medicare revenues would not change substantially if they continued to operate the same way under PPS as they had before PPS will not respond to the incentives of PPS. Therefore, we believe that inferences based on this approach will tend to be less valid for addressing our questions than those discussed in appendix V.

The remaining designs in table IV.1 would be unlikely to provide valid causal inferences about the effects of PPS on post-hospital care. While pretest-posttest designs would provide measures of change in an outcome from before to after PPS, there would be no way to rule out the possibility that the change would have been observed without the implementation of PPS. If an adequate model of how the outcome would have changed in the absence of PPS could be developed, the inference that the residual change was caused by PPS could be made with a moderate level of confidence. However, accepted models of post-hospital outcomes are not currently available. Posttest-only studies do not permit an assessment of whether or not a change has occurred, much less an inference that some particular event caused it.

## Other Criteria

The final five columns of table IV.1 contain information on the remaining criteria discussed earlier. Briefly, collecting and analyzing data within the context of the augmented nonequivalent control group design would be more time-consuming and expensive (see appendix V) than it would be for the time series approaches. Because of the cost of obtaining and analyzing the data, the sample sizes necessary to assure adequate statistical power and/or generalizability in the augmented nonequivalent control group design may be difficult to obtain within a limited budget. For this reason, the approach is rated somewhat lower than time series on these criteria. The time-series approaches have fewer problems because of the availability of time-series data on all Medicare use of post-hospital services over several years. Both designs are equivalent in terms of the potential for explanatory analyses although the information needed for explanatory analyses in the augmented retrospective nonequivalent control group design could be more expensive to collect because of the level of detail required (e.g., patient-level information).[2]

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[2] Explanation in the simple interrupted time-series is usually not possible because the time series can not be disaggregated to examine subgroups. Given that posttest-only studies are generally inadequate for making causal inferences, "explaining" causal relationships is also "not possible".

Appendix V

# A Two-Part Evaluation Plan for Determining the Effects of PPS on Post-Hospital Subacute Care

In chapter 3, we presented a two-part evaluation plan for developing information on the effects of PPS on five outcomes. That plan was based on two design strategies for developing attributive information from existing data. The purpose of this appendix is to present more detailed information on each of the two strategies. Both the interrupted time-series strategy and the augmented retrospective nonequivalent control group strategy have the potential for producing valid attributive information. The time-series approach can be used to address questions of changes in Medicare use and expenditures and, to a more limited extent, changes in quality (i.e., readmissions and mortality). The nonequivalent control group approach could be used to address the other outcomes (i.e., patient condition, access, and quality) but only if valid measures can be developed which are based on information available in medical or other health care provider records. In addition, as recommended in chapter 5, we believe that, at a minimum, HCFA should conduct the types of time-series studies we propose. Whether or not any nonequivalent control group studies need to be implemented is a complex policy decision which requires consideration of the various factors discussed in chapter 3.

## Interrupted Time Series Strategy

### Outcome Variables

We recommend an interrupted time-series quasi-experiment for evaluating the effects of PPS on the use of and expenditures for Medicare post-hospital services as well as for readmissions and mortality. This approach appears to be the most cost effective methodology, considering data available. The design, which can be analyzed using several different statistical techniques, can also be used to investigate other outcomes if and when measures are developed which rely on data already in the Medicare Statistical System. For example, Rand is currently working on a study to develop measures of quality of care using elements within the Medicare Statistical System (e.g., visits to physicians or outpatient clinics after discharge which are part B data).

In particular, the outcomes which should be investigated include

1) changes in the numbers (and proportions) of hospital discharges using post-hospital subacute services (SNF, home health agencies, and both);

2) changes in the average number of covered SNF days;

3) changes in average SNF length of stay (including non-covered days);

4) changes in the total number of home health visits per discharge;

5) changes in the numbers (and proportions) of hospital discharges readmitted within several specified time periods (e.g., 7 days, 14 days, and 30 days) broken down by whether or not they used post-hospital services;

6) changes in the numbers (and proportions) of hospital discharges dying within several specified time periods (e.g., 7 days, 30 days, and 60 days) broken down by whether or not they used post-hospital services.

In addition, reimbursements to providers for services rendered to patients should be analyzed separately and combined for "episodes of illness". However, the results of the analyses will have to be qualified because the information in the Medicare Statistical System on "reimbursement amount" represents interim payments to providers and is determined by the number of units of service and average unit cost of the provider rather than the actual cost to Medicare of that episode of care. Data on the relationship between the interim payment for an individual patient and the final Medicare payment is not centrally maintained. Therefore, analysis of the effects of PPS on total Medicare system costs is not possible using this approach. However, analysis of interim payments could provide useful information to compare to the annual Medicare expenditure data reported by HCFA.

## The Basic Time-Series Quasi-Experiment

The interrupted time-series quasi-experiment begins with a series of observations spaced at equal intervals (e.g., 50 months, 100 days) before and after the intervention. In the case of Medicare post-hospital care, the time series are outcomes such as number of readmissions or average SNF length of stay calculated over some set time period such as a month. The "interrupted" simply refers to identifying an event (i.e., the intervention) which occurred at a specified point in the time series. The analyses determine if the intervention was associated with any change in the outcome in subsequent time intervals. In the case of Medicare PPS, the passage of the legislation and, in turn, its actual implementation are the intervention.

The design uses pre-PPS observations to estimate what would have happened in the absence of PPS and compares the actual post-PPS data to this estimate. In theory, any factor which is a cause of changes in the outcome variable (over time), such as an increase in the numbers of frail elderly, will already be represented in the changes in the outcome variable over time, provided that the basic relationship between the two variables does not change at the same time as the intervention. However, attribution of causality to the intervention is weakened when it is plausible that such a change has occurred. By statistically estimating and removing all of the systematic changes in the outcome variable over time (including those associated with independent factors), any remaining changes at the time the intervention occurred can be attributed to the intervention (i.e., the effects of PPS).

In order for an independent factor to be a plausible alternative explanation for an observed change, it must change at, or about, the same time the intervention occurs. For example, in analyses of Medicare costs, decreases in inflation would only be important if inflation had previously been increasing and changed within a short period before or after the intervention. Otherwise, the change would already have been reflected in the Medicare costs. The closer the change in the independent variable is to the intervention, the more difficult it is to separate out its effect. In a later section, we will discuss this issue further with respect to identifying potential alternative explanations to be considered in analyses of our principal outcomes.

## Tailoring the Basic Approach to the PPS Intervention

The specific design to be used for evaluating the effects of PPS needs to be tailored to a number of circumstances surrounding the intervention. First, the program changes are being phased in over several periods which began on October 1, 1983. Approximately 15 percent of acute-care hospital stays were affected as of that date, another 20 percent in January 1984, nearly 25 percent beginning July 1984, and the remainder scattered throughout fiscal year 1984. The three year phase-in period also includes a transition from full cost-based reimbursement to uniform DRG prospective payment rates across the country. Thus, in FY84, each hospital was reimbursed prospectively using rates that were based 25 percent on regional average costs and 75 percent on its own historic costs. In fiscal year 1985 that ratio changed to one half based on regional and national average costs and half based on the hospital's prior costs. In fiscal year 1986, hospitals are scheduled to be reimbursed with rates based 55 percent on regional and national average costs and just 45 percent their own historic costs, with full transition to uniform national (urban and rural) DRG payments planned for fiscal year 1988.

Second, hospitals were initially given incentives to control their costs when the rate of increase in overall Medicare costs was capped in October 1982 with the implementation of TEFRA. Third, there is evidence that hospitals began making changes in anticipation of the actual implementation of PPS in October 1983. Fourth, when any given hospital comes under the PPS system, all Medicare beneficiaries in that hospital are affected—with limited exceptions. Fifth, analyses of costs will be complicated by a requirement built into the initial 1983 PPS legislation of "budget neutrality" based on the TEFRA limits through the end of FY85. This means that the costs of Medicare services were constrained to a particular level until the end of fiscal year 1985. Finally, many of the outcomes which PPS could affect were already changing. For example, hospital average lengths of stay had been falling steadily throughout the decade prior to PPS. Home health care use was increasing at more than 20 percent per year.

Two specific strategies are particularly useful in the PPS situation for attempting to deal with these circumstances. First, the phase-in of hospitals to PPS can be used to split hospitals into groups based on the time of implementation (i.e., based on their individual Medicare cost reporting year). This strategy is referred to by Cook and Campbell as "switching replications".[1] Second, the gradual transition from cost-based reimbursement to prospective payment can be modeled statistically as a dynamic process which gradually reaches its final, full effect. In addition, each of the important events (TEFRA, anticipatory reactions, and formal implementation) could be represented individually in the statistical model as having gradually increasing effects over time. The appropriateness of this model relative to other alternatives would have to be tested statistically. The role each of these strategies plays in increasing the validity of making a causal attribution is discussed in the following section. The potential limitations and problems with the analyses are also presented.

## Switching Replications

The phase-in of PPS can be handled by this variation to the design of the simple time series quasi-experiment. Because individual time-series can be formed for the dependent variables based on the time of PPS implementation for individual hospitals, the time-series for those hospitals coming under PPS at a later time can be used as a control for changes in independent variables which might have occurred coincident with the implementation of PPS in the first group. Later, when the second group of hospitals comes under PPS, the time-series for the initial group of hospitals can serve as a control (albeit a weaker one than in the first case because changes due to PPS may still be occurring). This design is shown graphically in figure V.1.

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[1] T. D. Cook and D. T. Campbell, Quasi-experimentation: Design and Analysis Issues for Field Settings (Chicago: Rand McNally, 1979), pp. 223ff.

**Figure V.1: Diagram of the Augmented Interrupted Time-Series Design**

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    1980        1981        1982          1983          1984         1985
jfmamjjasondjfmamjjasondjfmamjjas ondjfma mjjas ond jfmamj jasondjfmamjjasond. . .

                  ...ooooooooooooa
                                  ooooooob
Group 1 (Oct-Sept FY)                     oooooc
                                                ooo oooooo oooooooooooooooooo. . .

                  ...ooooooooooooa
                                  ooooooob
Group 2 (Jan-Dec FY)                      ooooo oood
                                                    oooooo oooooooooooooooooo. . .

                  ...ooooooooooooa
                                  ooooooob
Group 3 (July-June FY)                    ooooo ooo ooooooe
                                                           oooooooooooooooooo. . .
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[a] TEFRA became effective, placing hospitals under a prospective cost cap

[b] PPS passed the Congress.

[c] PPS became effective for hospitals with October 1 to September 30 fiscal years

[d] PPS became effective for hospitals with January 1 to December 30 fiscal years

[e] PPS became effective for hospitals with July 1 to June 30 fiscal years

The strength of this design variation derives from its ability to rule out many threats to valid causal inferences and its potential for enhancing generalizability. The enhanced validity of causal inference derives from the ability to show an effect in one group and not in another group at the same time. For example, in the PPS case, we would examine the change in the number of home health visits provided to patients discharged from a group of hospitals under PPS to see if the change in visits was larger than the change in the number of home health visits provided to patients discharged from the group of hospitals not under PPS at the same time. If the change went in the anticipated direction, then later, when the second group of hospitals went under PPS, we would expect the change in the number of home health visits for that group to be larger at that point in time than the change for the group which was already under PPS.

Similarly, the use of switching replications permits separating the combined effects of TEFRA and anticipation of the implementation of PPS from those of the formal implementation of PPS. These changes occurred several months prior to the implementation of PPS in the first group of hospitals and were a constant factor for each group of hospitals that was subsequently phased into PPS. Therefore an interruption is expected in outcomes in all three groups of hospitals due to TEFRA and/or anticipation prior to the implementation of PPS. Later, roughly coincident with the implementation of PPS, a second interruption is expected in outcomes for each group of hospitals due to the formal implementation of PPS. The effects of TEFRA and anticipation of PPS should be estimated best in the group of hospitals whose Medicare cost reporting year started in July 1984 because there is a longer period of time between the two events. However, switching replications does nothing to help separate the effects of TEFRA from those occurring in anticipation of PPS.

Enhanced generalizability from the use of switching replications comes from the demonstration of the effect in different groups in different places at different times. For example, the group of hospitals which choose one cost reporting period may have a relatively larger representation of large urban hospitals than hospitals choosing a different cost reporting period. Analyses of the similarities and differences among hospitals in the three basic categories is an important part of the job. The data necessary to make these comparisons are available in the Provider of Service file (described in appendix III) and can be validated against data collected by the American Hospital Association.

## Data Analysis Approach

Generally, the analysis of time series data focuses on time-domain models and, in particular on Autoregressive Integrated Moving Average (ARIMA) models and regression-based approaches (e.g., generalized least squares or pooled cross-sectional time series). The primary difference between the two approaches is that ARIMA models are empirically identified based on the structure of the data (i.e., pattern of changes over time) and regression-based approaches require that the analyst develop a theoretical model of the relationships among several independent variables which is hypothesized to represent the causal relationships among the variables. According to McCleary and Hay, "when relatively long series are available, an empirical ARIMA approach will ordinarily give the best results. But when relatively long series are not available, regression approaches informed by prior research and/or theory [emphasis added] will give the best results."[2]

The critical features in choosing one approach over the other are the length of the time series and the strength of theoretical knowledge in the substantive area. In the case of MSS data, at least 48 months of monthly pre-TEFRA data and roughly 27 months of post-TEFRA data could be constructed from currently available data (i.e., HAINURO). This amounts to about 75 months of time series data, which is enough to consider using ARIMA models. Even though econometric models of various parts of the health care system exist, ARIMA appears to be a better choice considering cost and data availability.

Finally, the interrupted time series/ARIMA modeling approach provides an excellent opportunity for being able to model the complex pattern of changes beginning with TEFRA and continuing through the phased implementation of PPS. The long pre-TEFRA time-series permits estimation of what would have happened in the absence of a shift toward prospective payment. As a result, the time-series approach is the one which could potentially provide strong, attributive information about the independent effects of the different aspects of the shift from cost-based reimbursement to prospective payment discussed above. However, the strength of the attribution could be limited by the relatively short time intervals between the various shifts (e.g., TEFRA to passage of PPS) and the complexity of the statistical models necessary to represent those shifts.

## The Data

In the following sections we will discuss the quality of the particular MSS data elements which would be used to construct the primary outcomes discussed earlier with regard to consistency, completeness, and accuracy (see table V.1).

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[2] R. McCleary and R. A. Hay, Applied Time Series Analysis for the Social Sciences (Beverly Hills, Calif.: Sage Publications, 1980), p. 20.

**Table V.1: Assessment of Quality of Medicare Statistical System Data Elements Needed to Construct Primary Outcome Variables**

| Data element[a] | Source of data element | Consistency of definition over time | Completeness of data | Accuracy of data |
|---|---|---|---|---|
| Presence of a bill for:[b] | | | | |
| SNF services | SNF bill | + | ++ | + |
| Home health care | HH bill | ? | ++ | + |
| Both | SNF + HH bill | ? | ++ | + |
| Date of Admission - SNF[c] | SNF bill | ++ | ++ | + |
| Date of Discharge - SNF[c] | SNF bill | ++ | 0 | 0 |
| Covered Days - SNF | SNF bill | ? | ++ | ++ |
| Date of Admission - Hospital[d] | Hosp. bill | ++ | ++ | ++ |
| Date of Discharge - Hospital[d] | Hosp. bill | ++ | ++ | ++ |
| Number of Home Health visits | HH bill | + | ++ | + |
| Date of death[e] | HIM file[f] | + | 0 | + |
| Reimbursement Amount[g] SNF | SNF bill | ? | ++ | + |
| Home health | HH bill | ? | ++ | ? |

++ - good information confirming quality available
+ - good information on quality not available but, based on internal controls and/or "common sense", should be adequate
0 - good information on quality not available and no clear consensus on which to base a judgement exists
? - changing coverage criteria could affect the value despite no change in formal definition. However, the analysis should still be feasible.

[a] Data elements from individual patient bills (i.e., bills to Medicare for services rendered to an individual patient) could come from several different files within the Medicare Statistical System; all of them derive from the Utilization Record.

[b] Sum to numbers of patients using the service

[c] Used to calculate number of SNF days of care

[d] Used to calculate readmissions (and time to readmission)

[e] Used to calculate mortality (and time to death)

[f] Health Insurance Master file

[g] Represents an interim payment to a provider based on the number of units of service rendered and the average cost of delivering a unit of service. Is later adjusted in aggregate for a given provider based on a final, audited cost report.

### Consistency

Our method for assessing consistency of definition over time leans heavily on the nature of the data elements, the testimony of experts on changes in coverage and MSS data definitions, and the plausibility of the idea that the definition could have changed in important ways over time. While reconstructing changes in definition and coverage as reflected in the part A fiscal intermediary manual over time would be the most definitive approach for describing the changes (if any) which have occurred, there is no readily available source of the substituted changes. This happens because the manual is periodically updated with new rules and procedures and the old sections are removed. A log of the transmittals is kept by the Office of Issuances, HCFA which has dates and some information on the sections changed. Reconstructing those changes would require obtaining a manual from before the period in question (pre-1978), obtaining the over 500 transmittals of changes and doing a content analysis to identify relevant changes and their timing. We did not attempt to do this.

In lieu of this, we have examined whether it is plausible to believe that the formal definitions of individual data elements have or have not changed over time. We have also examined any major legislative or executive policy changes which affected coverage. In general, no evidence of changes in formal definitions was found. Therefore, our primary concern is with the extent and timing of changes in coverage rules and criteria and the effects of those changes on the number and types of patients eligible for post-hospital services. In addition, since the only measure of Medicare expenditures that is available is tied to the amount of service rendered, it is also subject to changes in coverage rules. With respect to home health, the last significant legislative changes in coverage occurred in 1980.[3] The next earlier changes occurred in 1972. The 1980 changes are far enough away from the implementation of PPS that they can be included in the statistical model if necessary. As noted in chapter 2, there was a change in interpretation of SNF coverage criteria in 1972.[4] Language permitting the removal of the 3-day prior hospitalization requirement was included in TEFRA (1982) but not implemented.

## Completeness

For many of the data elements, completeness of Medicare billing data was assessed by examination of the part A utilization data for a random sample of 36,000 Medicare beneficiaries (extracted from the HAINURO database as part of GAO analyses conducted for a long-term care study in progress). The data examined contains information on use and reimbursement amounts for hospital, SNF and home health care in calendar year 1982. We found that these data were virtually totally complete. For other data elements (e.g., hospital cost reporting period for starting PPS and location; date of death), we rely on the plausibility argument — the data should be complete because of HHS internal controls and audits and the importance of the information in computing reimbursements.

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[3] Judith Lavor Williams, Gary Gaumer, and Margot A. Cella, Home Health Services: An Industry in Transition (Cambridge, Mass.: Abt Associates, 1984), pp. 19-25.

[4] Judith Feder and William Scanlon, Medicare and Medicaid Patients Access to Skilled Nursing Facilities (Washington, D.C.: The Urban Institute, 1981), pp. 15-16.

### Accuracy

As far as we have been able to determine, based on conversations with HCFA officials of the Bureau of Data Management Services, the Office of the Inspector General (HHS) and GAO auditors, there has been only one major study of the quality/accuracy of Medicare data.[5] That study deals only with hospital data and only with six data elements (date of admission, date of discharge, sex, primary diagnosis, other diagnosis and primary procedure). Our judgments regarding the accuracy of the current data are therefore based on extrapolation of the IOM study to similar data elements from SNFs and home health agencies as well as the inherent "reasonableness" of concluding that a particular data element was accurate.

## GAO Assessment of Individual Data Elements

As table V.1 shows, we are primarily interested in 11 individual data elements. A double plus in the table means that we have good evidence that the data element is of high quality. A single plus means that although good evidence is not available, an argument can be made (based on internal controls and/or the nature of the data element) that the data element is of sufficient quality that a reasonable person would agree that it could be used. A zero means that no clear consensus on the quality of the element is possible. The question marks in the consistency column mean that we need to be concerned that changes in coverage criteria could affect the actual values reported (although the formal definition of the data field had not changed).

### Presence of a Bill

The formal meaning of a bill being present in the Medicare Statistical System can reasonably be considered to be constant over time; a bill present in the system means that a patient had some care reimbursed by Medicare. However, changes in the coverage rules could mean that changes in the number of patients eligible could occur. As mentioned above, changes did occur in the home health benefit in 1980 which will have to be considered in analyzing the effects of PPS on the number of patients using the home health benefit. Similar changes in the SNF benefit have not occurred. The data must be complete by definition. Accuracy should also be assured with the possible exception of lost bills or similar problems. There is no information available on the extent to which that might occur although it seems unlikely to be a significant problem.

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[5] Institute of Medicine, Reliability of Medicare Hospital Discharge Records (Washington, D.C.: National Academy of Sciences, 1977).

### Dates of Admission and Discharge for Hospital and SNF Stays

The formal definition of date of admission and discharge has been constant since at least 1973, based on the date recorded on the relevant page in the fiscal intermediary manual. The data are also complete, based on an examination of the HAINURO data and the fact that bills cannot be accepted until those dates are validly recorded. The dates for hospitals are essentially 100 percent accurate (99.9 and 99.7 percent). Although the same data for SNF stays have not been formally checked, they are submitted on the same forms as hospitals use and subjected to the same internal controls in terms of computer edit checks.

HCFA sources have indicated that in a fairly large number of cases, SNF bills do not include discharge dates for SNF stays. In cases where a specified number of days of covered care may have been approved upon admission, or patients stayed in the facility beyond the period covered by Medicare, date of discharge is not necessary for computing Medicare reimbursement. For the purposes here, this missing information would not constitute a major problem, because Medicare-covered days of care could be determined directly from the data field which reports this figure.

### Number of Home Health Visits

The number of home health visits is the primary measure of home health use in the proposed study. It is recorded as a data item on the home health bill, which is different from that used by hospitals and SNFs. As a result, the information which is applicable to hospitals and SNFs is less useful for home health data. The formal definition of the data element over time seems unlikely to have changed; as discussed above, we do know that the coverage rules changed significantly in 1980. The data are complete but their accuracy has not been investigated. A determination of the accuracy of the data would be complicated by the fact that HCFA has determined that it pays for a substantial number of home health visits which it considers to be noncovered (see chapter 4; National Home Health Study).

### Date of Death

Date of death is essential to an investigation of changes in mortality as a result of PPS. The information in the Medicare Statistical System on mortality is maintained in the Health Insurance Master file and is updated from two sources. First, if a bill is received on which the patient is recorded as having been discharged dead, the information on HIM is updated. Second, the HIM file is updated daily based on death notices received by the Social Security program. While it reasonable to assume that the consistency of the definition has not changed over time, the completeness of the data is almost certain to decrease as one moves from the past toward the present, as is the accuracy. The length of time it takes before one can be reasonably sure that a death has been accurately reported to Social Security is unknown.

### Reimbursement Amount

The data field on SNF and home health bills called "reimbursement amount" represents an interim payment to the provider for the number of days of SNF care or the number of home health visits received by the patient. The amount is determined by multiplying the number of units of service by either the average cost per unit of service or a fixed proportion of charges (only for home health agencies). In either case, the estimate is based on the latest available cost report which the provider has filed. Final reimbursements are based on aggregate annual costs after the year ends and may be more or less than the sum of the individual reimbursement amounts. HCFA has an extensive program to monitor overpayments but does not keep track of underpayments in a central location (the fiscal intermediaries have primary responsibility).

While it seems reasonable to conclude that the formal definition of the reimbursement amount has remained constant over time, it also seems likely that the methods for determining the average cost per unit of service may have changed. In addition, the changes in coverage rules would also have ripple effects on the reimbursement amounts. The data are essentially complete; only a few cases in the HAINURO data we reviewed had invalid values.

The accuracy of the data is dependent on two factors. First, it depends on the accuracy of the use data. The accuracy of SNF use data was judged to be adequate; the accuracy of the home health use data is unknown. Second, it depends on the extent to which the average cost per unit of service calculations accurately reflect Medicare system costs. Common sense would indicate caution since good information is not available on the relationship between the interim payments and final aggregate payments to a provider. However, if appropriate caveats on its use are given, the information gained from an analysis of reimbursement amounts may provide some important information. It is to this second use that the ratings on accuracy refer.

## Summary

The above analysis suggests that the available data on SNF and hospital services would support strong inferences based on interrupted time-series analyses of SNF use and hospital readmissions. The information available on the quality of the data on home health visits suggests that if the data are of sufficient accuracy, then strong inferences based on analyses of changes in the use of home health care would be possible. Any use of the reimbursement amounts to represent changes in Medicare system costs would be inappropriate without first demonstrating that, on average, the total of the reimbursement amounts were not biased toward over- or under-reimbursement of providers relative to their final audited annual reimbursement. Finally, information available on the date of death is insufficient to know how accurate determinations of mortality in the very recent past would be. This suggests that studies of mortality would have to be considered very tentative unless the accuracy and timeliness of system updates is established.

## Medicare Statistical System Databases

In appendix III, we discussed a number of different data files maintained by the Medicare program that might prove useful in analyses of the effects of PPS. HAINURO and MADRS are the two best sources for the data elements needed to construct the time series required in the proposed studies. Both sources contain the required data elements over the necessary time period. Both would require reorganization from beneficiary (case record) files into longitudinal files in which all beneficiary bills associated with a particular hospitalization were assigned to a time period based on the date of hospital discharge. The date of hospital discharge is important because it determines whether or not a particular hospitalization was reimbursed at the prospective rate for an episode of care.

In making a choice between using these two sources to develop the individual time-series, a number of factors need to be considered. MADRS is a new database that HCFA has already invested time and money into developing. It will be a complete record of part A and part B use and expenditure information beginning in 1980. MADRS promises to be a very useful research and evaluation tool when it is completed because it will represent the first database in the Medicare Statistical System that is both complete and research-oriented. A secondary reorganization of the

MADRS database into a longitudinal, episode-of-illness database would complete the restructuring of the Medicare data into a system that could be used to address a wide range of policy issues.

The drawbacks to proceeding along this route concern primarily time and cost. It will take time to complete the MADRS database. As noted in chapter 3, recent problems have set back production of the MADRS file. Specifically, a portion of the intermediate tapes being used to create the file were accidentally destroyed. HCFA has told us that, as a result, the original plans to complete the file for 1980 forward have been revised, and the file will only be completed for 1982 forward. If MADRS does not include several years of pre-TEFRA and pre-PPS data, it will not be useable for time-series analyses of PPS effects on the use of or expenditures for any Medicare-covered services, nor for analyses of changes in hospital readmissions, mortality rates, or other studies of patterns of care or service use. The subsequent reorganization into a longitudinal file is likely to be more costly than a similar reorganization of the HAINURO file simply because MADRS is a larger file. HAINURO contains more years of data (1978-1979) and is more rapidly updated than MADRS is planned to be. However, in our opinion, the benefits to be derived from completing the MADRS project as originally planned and then creating a separate, longitudinal file containing the same information outweigh the costs. Having these two files would enhance HCFA's ability to conduct evaluation and demonstration projects as well as respond to external requests for information.

## General Analysis Plan

As presented earlier in this appendix, ARIMA models with intervention components would be used as the primary analytical strategy for the time-series data. As needed, multivariate ARIMA models would be developed, using independent variables which represent threats to valid causal inference. Table V.2 lists the independent variables which are most likely to be important in the analyses. The variables were initially identified in chapter 2 and discussed briefly in chapter 3.

**Table V.2: Factors Other Than PPS Which Could Affect Outcomes and Ways That the Augmented Time-Series Approach Will Account for Them**

| Factor affecting long-term care | Design and analysis strategies | |
|---|---|---|
| | In ITS/ARIMA | In TS/regression |
| **Socio-economic factors** | | |
| 1. Aging population | | |
| a. increasing numbers over time[a] | 1. ARIMA model<br>2. control series | 1. control group |
| b. older patients may be affected differently[b] | 1. construct separate time series for each age group and analyze | 1. incorporate age as an independent variable in a model<br>2. do separate analyses for age groupings |
| 2. Ability to pay for services affects which services are used[a] | 1. Analyze SNF and home health separately<br>2. Control series | 1. analyze SNF and home health separately<br>2. control group |
| Introduction of new health care technologies[a] | 1. Intervention variables | 1. control group |
| Local/regional variation in use and practice (e.g. hospital length of stay (LOS)[b] | 1. create separate series based on length of stay and analyze | 1. include LOS in regression model<br>2. conduct separate analyses on subgroups formed on basis of LOS |
| **State health policies** | | |
| 1. CON regulation of supply[b] | 1. create separate series on basis of strictness of CON and analyze | 1. include variable describing strictness of CON in model<br>2. Stratify on basis of CON and conduct analyses on subgroups |
| 2. Medicaid reimbursement policies[b] | 1. create separate series on basis of relative attractiveness of Medicaid reimbursement rate and analyze | 1. include variable describing relative attractiveness of Medicaid reimbursement rate in model<br>2. stratify on basis of relative attractiveness and conduct analyses on subgroups |

[a] indicates a variables which could be important to control for in making a causal attribution

[b] indicates variables primarily of interest because of potential for differential impact

Some of the variables represent factors which should be investigated because the effects of PPS are likely to vary as a function of the level of the variable. For example, the magnitude of changes in the use of SNF services is likely to vary with the availability of SNF beds (i.e., Certificate of Need constraints on bed supply). The analysis of these variables would proceed by creating individual time-series for each subgroup and analyzing each.

Other variables are trends over time which need to be taken into account in estimating the effects of PPS. For example, the trend in the use of home health has been steadily upward. This type of variable would be taken into account using the ARIMA model. None of the variables in Table V.2 would seem to be the type of factor which would need to be included in a multivariate ARIMA model because none of them changed at or about the time PPS was implemented.

As table V.2 shows, many of the variables identified in chapter 2 are primarily of interest because of the likelihood that PPS will have differential effects at different levels of the variable. These include age of the beneficiary, hospital length of stay, and Certificate of Need control of nursing home beds. Variables such as age and hospital length of stay which are based on dates and are available from the MSS should be quite accurate. Other variables, such as CON regulation or State variations in Medicaid practice, could be used to create subgroups for analyses of differential effects as questions arise from the outcome analyses. Current data on CON and state Medicaid policies are available through HCFA and surveys conducted by organizations such as the Intergovernmental Health Policy Project. Because of the relative coarseness of the categories (e.g., strict versus relaxed CON; relative attractiveness of Medicaid reimbursement vis-a-vis Medicare reimbursement), the reliability and accuracy of the resulting classification should pose no real problems.

## Study Costs

Assuming that ARIMA models are used and the database is available, we believe that the cost of conducting the data analyses necessary to answer questions about the effects of PPS on Medicare use and costs will be reasonable (see table V.3). HHS has indicated that it will cost approximately $80,000 to complete the MADRS file. After the completion of MADRS, the primary costs would be those associated with the reorganization of the unit record data in MADRS into appropriate larger units (e.g. monthly time series of SNF costs). The reorganization would require two steps. First, the overall file would have to be resorted into monthly files and unneeded data elements removed. We estimate that this would take a programmer two to three months to develop and cost approximately $27,000. Running the program on a year of data would cost roughly $1400. Overall, the first stage should cost about $35,000.

**Table V.3: Estimated Costs of Conducting Interrupted Time-Series Analyses of Medicare Administrative Data**

| Tasks | Costs |
|---|---|
| Complete MADRS | $ 80,000 |
| Construct monthly files based on episodes of illness (including programmer time) | |
| 1. Develop program (60 days x $441/day) | 26,640 |
| 2. Run data (6 years x $1400/year) | 8,400 |
| Construct monthly time series and conduct analyses | |
| 1. Analysts (2 x 160 days x $441/day) | 141,120 |
| 2. Computer time ($2000/month x 12 months) | 24,000 |
| **Total** | **$280,160** |

The second stage would involve aggregating the individual records into monthly time series. This task can be done in several steps, beginning with relatively small aggregates such as patients within a hospital and building up to the overall national series as developed above. This stage would most likely be done by the primary analyst as part of the overall study. We estimate that the principal analyses of use, cost, readmissions and mortality would take approximately two analysts one year to complete at a cost of approximately $141,000. This adds up to approximately $280,000 in direct study costs. If the study were to be contracted, administrative costs would have to be considered.

## Augmented Retrospective Nonequivalent Control Group Strategy

### Introduction

The augmented retrospective nonequivalent control group design is the basis for the second part of the evaluation plan for investigating the effects of PPS (see also appendix IV). It is likely to produce attributive information which is less credible than the time-series approach and at a greater cost in time and resources. We argued in chapter 3 that it should be reserved for situations where attributive information is crucial and the time series approach cannot be used because the data is not in the Medicare Statistical System. The outcomes for which this is true include patient condition at time of hospital discharge, quality of post-hospital care and access to post-hospital care.

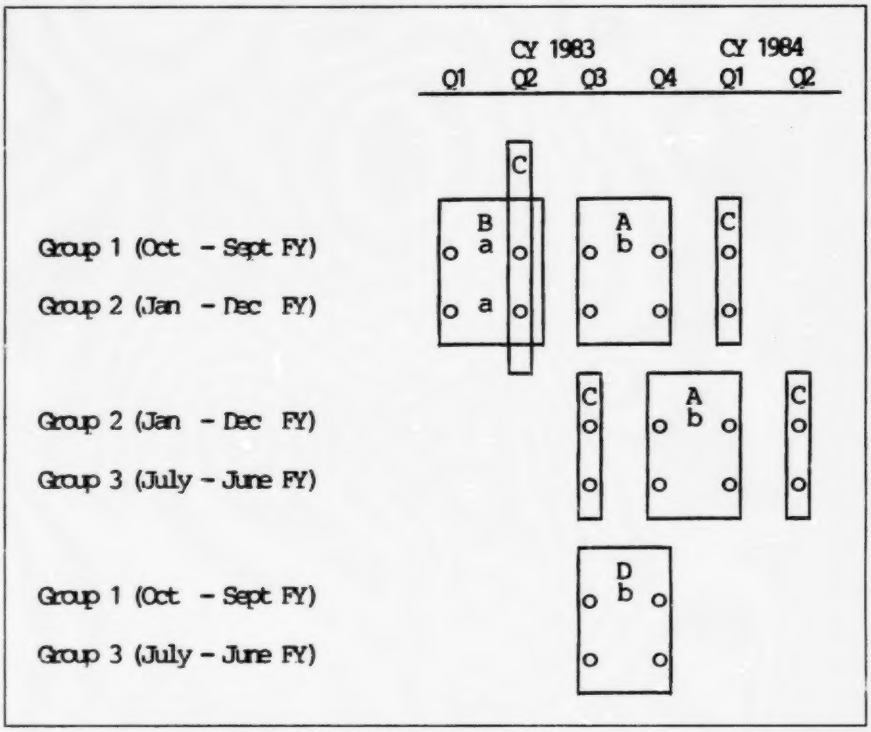
In addition, the results of the interrupted time-series analyses should indicate that the effects associated with PPS implementation (as opposed to anticipatory effects) are relatively large before substantial resources are devoted to this approach. The design can only provide valid attributions with respect to the effects of PPS implementation. If the anticipatory effects are large relative to the implementation effects, the gain in information and confidence about the effects of PPS might not be worth the added cost. Finally, some additional measurement development and/

or validation would be necessary before these studies could proceed. In the following sections, we will use physical condition at the time of hospital discharge to illustrate the specifics of the design. However, the design could also be employed to examine the effects of PPS on measures derived from nursing home or home health records.

## The Basic Conceptualization

The basic retrospective nonequivalent control group design is ordinarily structured with a treatment group in which individuals are measured before and after the treatment and a control group in which individuals are measured at the same times as those in the treatment group but who do not receive the treatment (as represented by the boxes labelled A or B in figure V.2). The change in the control group from the pretest to the posttest is used as an estimate for the change which would have occurred in the absence of the intervention. If the change in the treatment group is larger (statistically) than that in the control group, the treatment is said to have had an effect, assuming that all other plausible explanations have been ruled out.

**Figure V.2: Schematic Representation of the Augmented Retrospective Nonequivalent Control Group Design**



A - Basic replications of augmented NECG design

B - Observations to provide information on changes in outcomes associated with (but not necessarily caused by) the passage of PPS.

C - Observations to be used as double pre-tests or additional post-tests.

D - Possible third replication of basic NECG comparison.

a - Passage of PPS legislation.

b - Implementation of PPS.

## Adaptation of the Design for Studying the Effects of PPS

The augmented retrospective nonequivalent control group design that we have developed for evaluating the effects of PPS differs from the basic design in two fundamental ways. First, instead of measuring an individual patient before and after a hospitalization affected by PPS, separate samples of patients would be drawn from the Medicare discharge rosters of a hospital before and after PPS. By aggregating patients to the hospital-level and using the mean patient condition for each individual hospital, the analysis can then use conventional procedures for testing effects of PPS (e.g., analysis of covariance). With hospitals as the unit of analysis, the average pretest patient condition and average posttest patient condition should be related as long as the patients sampled are representative of the hospital's Medicare patients and the case mix within the hospital has not changed substantially (i.e., the within-hospital Medicare population has not changed between the pretest and posttest on variables related to the outcome).[6]

The second difference between the basic design and the augmented design is the addition of a replication of the basic comparison. The two comparisons labelled "A" in figure V.2 represent independent replications of the implementation of PPS.[7] Demonstrating that PPS had measurable effects on independent groups of hospitals at two different points in time (i.e., October 1983 and January 1984) helps to strengthen the causal inferences by providing us with the opportunity to rule out a number of otherwise plausible explanations. For example, it might be argued that hospitals with different cost reporting years would be affected differently. However, if we find the same effect in groups of hospitals with different cost reporting years, this explanation can be ruled out.

## Additional Adaptations Which Could Be Added

### Enhancements to Internal Validity

There are several additional observations that could be added to the two replications which would enhance the internal validity and interpretability of the results. First, a third replication could be constructed by adding the observations in the box marked "D" in figure V.2. If this replication were made independent of the other two, it would increase the total sample size by 50 percent. In our opinion, the gain in internal validity represented by this addition is probably not worth the added cost.

Second, a set of observations could be added which examined the anticipatory effects of PPS (represented by the box marked "B" in figure V.2).

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[6] While some experts expect measures of case mix to show changes as a result of incentives to report secondary diagnoses, surgical procedures and the like (therefore resulting in higher reimbursements), it seems unlikely to us that large changes will occur, in the short run, in the actual case mix of patients in most hospitals.

[7] Because Group 2 is used in each replication, it is necessary to obtain two samples for Group 2 to achieve complete independence for the replication.

While adding these observations would not allow us to attribute any observed changes to the passage of PPS, they would be important for interpreting the results of the basic comparisons. They would provide an understanding of how the outcomes were changing prior to the implementation of PPS. Collecting the observations in the manner specified (i.e., as essentially additional pre-PPS observations), also allows them to be used as added covariates in the basic statistical analyses. Third, individual pre-PPS (to serve as additional covariates) or post-PPS observations (to examine longer-term effects of PPS) could be added to the basic design as shown by the boxes in figure V.2 marked "C".

### Enhancements to Facilitate Description and/or Explanation

As was indicated in the body of this report, the argument for concentrating on valid causal inference focused on the need to correctly assign credit or blame for any observed changes in outcomes to PPS. To the extent that we become convinced that this is either not necessary for policy-making (e.g., because PPS is here to stay regardless of the outcome) or less important than identifying problems regardless of the cause, the design could be redirected or modified to serve other purposes. For example, a longitudinal within-patient component might be substituted for the second replication if more extensive information on the entire episode of illness was considered more important than the stronger internal validity offered by the replication. Alternatively, case studies of changes made by a sample of hospitals from the passage of PPS through the time that the post-PPS observations were made could be used to construct a "causal model" of how particular types of hospital behavior were translated into particular types of patient outcomes. This explanation of variation in outcomes could be important in identifying potential changes needed in the Medicare program.

## Factors Other Than PPS That Should Be Considered

The same factors which have already been discussed in the section on time series data are relevant in the present design (see Time-series/ Regression column 3; table V.2). However, since the study requires original data collection based on sampling representative groups of patients from a sample of hospitals which are participating in Medicare, we have to be sure that in developing a sampling plan we adequately represent the variables that are considered most important.

Two factors which are likely to be particularly important are region of the country (with respect to sampling hospitals) and age of the patient (with respect to sampling patients within hospitals). These variables (and others) would be used in the matching procedures. Region of the country is important because it is related to such factors as hospital average length of stay and use of post-hospital services. An alternative approach would be to group hospitals based on the likely effects of PPS. Several analyses have concluded that some hospitals will have to make substantially greater changes than others to remain solvent under PPS.

Patient age is important because it is known to be related to general physical condition and to differential rates of use in the pre-PPS period. We believe reliable data on patient age by hospitals could be obtained by matching files in the Medicare Statistical System, but this would be quite expensive. Similar information is available from the Professional Activities Survey (PAS) of the Commission on Professional Hospital Activities (CPHA) for many, but not all, acute care hospitals.

## Sample Size and Sampling Plan

In the earlier discussion of the interrupted time series approach, the issue of sample size and statistical power was not addressed because the statistical analyses would be done on the universe of Medicare data rather than a sample. However, in this case, our concern is to obtain a large enough sample so that the statistical precision is acceptably high. In addition, an ability to generalize any result to the nation would be desireable.

The nature of the evaluation design requires a two stage sampling plan. In Stage 1, a representative sample of hospitals must be drawn to allow generalization to the nation. In Stage 2, a representative sample of Medicare discharges would be selected. The goal is to optimize the sample sizes in each stage such that the overall error is minimized without increasing data collection costs by oversampling. This, of course, is dependent on knowledge of several critical parameters. At this time, educated guesses are the only basis for specifying the values of some of these parameters.

To reduce the total number of hospitals and thereby the costs, we would use a matching strategy within each replication whereby clusters of similar hospitals would be specified and paired units would be randomly selected. While matching has several technical pitfalls, using reliable variables and multiple observations (over time) on each minimizes these difficulties. The principal rationale for the matching prior to selection is to reduce the error variance for testing whether PPS leads to an average reduction in physical condition. In estimating the number of pairs of hospitals, we have assumed that the correlation between the average pre- and post-PPS patient physical condition ratings for each hospital, as well as between the pre-post difference scores across each pair of hospitals, is about 0.6. If the correlations were much smaller than this, pairing hospitals through matching would not have the desired effect of reducing the error variance. If the correlations are greater, the statistical power will be enhanced even more.

The number of patients sampled in each hospital is determined by the expected average variation in physical condition among patients at discharge and by the average number of patients discharged from that hospital in a given time period (in our design, a calendar quarter). We are using data from some recent work by a group in Oregon who developed a measure of patient condition with scores that can range from 0 (health) to 24 (very dependent). In a sample of patients from two hospitals, they found that the pre-PPS mean on their scale was 8.3 with a variance of 49.

The reliability and validity of their measure is not well established and patients in Oregon may be different in important ways from other Medicare patients. However, it is the only information available to us. In addition, given the likelihood that their measure is less reliable than a more fully developed instrument and the relatively large variance of scores on the measure, our estimates of sample size based on these data are likely to be larger than would be necessary to detect changes of the magnitude we are expecting. We are also assuming that the variance does not change as a result of PPS and that we need to have enough power to detect a change in patient condition of 10 percent. Finally, we estimate that, on average, approximately 435 Medicare patients are discharged from a hospital in a given quarter.

Under this set of assumptions, a random sample of approximately 170 patients per observation (i.e., pre-PPS and post-PPS) per hospital would be necessary to insure that the error of estimate derived for each observation would be small enough that the 10 percent change could be detected with 95 percent confidence. However, if we are willing to sacrifice generalizability at the patient level in the interests of saving costs, we estimate that a random sample of approximately 50 patients per observation per hospital would be necessary to obtain stable estimates of average patient condition within hospitals for a statistical analysis with hospitals as the unit of analysis. In either case the random sample is necessary to insure that the estimate of the hospital average is representative of all patients in the hospital.

In terms of the number of hospitals needed to obtain an adequate estimate of the effects of PPS on patient condition, we estimate that a random sample of approximately 80 pairs of hospitals per replication (i.e., 80 hospitals in Group 1 would be paired with 80 hospitals in Group 2 and a different 80 hospitals in Group 2 would be paired with 80 hospitals in Group 3) would be required for both a test with adequate statistical power as well as generalizability to the group of hospitals with a particular cost reporting period. This totals to 320 hospitals with either 100 or 340 patients per hospital depending on the level of generalizability desired. It is our opinion that generalizability at the hospital level (i.e., 100 patients per hospital) would be acceptable for addressing most questions. However, we provide cost estimates based on both 100 and 340 records per hospital.

## Costs Involved in Using the Retrospective Nonequivalent Control Group Design

Given the number of uncertainties associated with estimating the influence of PPS on patient condition at hospital discharge, we have provided a range of cost projections that are based on different assumptions and include various levels of augmentation of the basic nonequivalent control group design. Estimating the cost of conducting a retrospective case record review using the nonequivalent control group design rests on four factors: (1) the number of hospitals included (80 per group); (2) the number of patient records needed to represent each hospital (100 or 340 records per hospital for the basic design); (3) the extent to which the design is augmented (e.g., how many pre-PPS and post-PPS observations are included); and (4) the costs associated with abstracting the desired information from each case record within each hospital.

The costs associated with abstracting data from medical records depends on a variety of factors including the amount and complexity of the abstracting process and the number of outcomes recorded. At a minimum, we estimate that it would cost about $10 per record to obtain simple demographic and treatment information along with a measure of patients' condition at the time of hospital discharge. At the high end, we estimate that it would cost approximately $50 per patient to obtain extensive information from hospital records, information on the use of Medicare post-hospital care and some additional limited data from SNF and home health records for those patients who used post-hospital services.

A range of estimates is presented in table V.4 for the basic design and the two augmentations we feel should be added. These values run from $0.7 million to $10.0 million, depending upon different assumptions on the cost per record and degree of augmentation of the design. For component A, the basic design with two independent replications, the cost of basic data collection range from $0.7 to $5.8 million, depending on the costs per record and the number of patients per observation. Adding the second design component (i.e., component B) — comparisons directed at assessing the magnitude of the anticipatory response to the passage of the PPS legislation — calls for a smaller set of observations. The costs of data collection for this element ranges from about $0.2 to $2.7 million. (See tables V.4.)

Table V.4: Estimated Costs of Augmented Retrospective Nonequivalent Control Group Design

| Design component | Pairs of hospitals | Total hospitals | Observations per hospital | Costs (in millions) | | | |
|---|---|---|---|---|---|---|---|
| | | | | 50 patients[a] | | 170 patients[a] | |
| | | | | $10 | $50 | $10 | $50 |
| | | | | (per record) | | (per record) | |
| A. Basic design | 160 | **320** | 2 | 0.32 | 1.6 | 1.088 | 5.44 |
| Other direct costs[b] | | | | 0.349 | 0.349 | 0.397 | 0.397 |
| Subtotal Basic | | | | 0.669 | 1.949 | 1.485 | 5.837 |
| B. Anticipatory effects | 80 | **160** | 2 | 0.16 | 0.8 | 0.544 | 2.72 |
| C. Additional pre/post-test | 80 | **160** | 1 | 0.08 | 0.4 | 0.272 | 1.36 |
| Subtotal Augmentations | | | | 0.24 | 1.2 | 0.816 | 4.08 |
| **Total** | | **320** | **2 to 4** | **0.909** | **3.149** | **2.301** | **9.917** |

[a] The number of patient records that must be abstracted at each pre- and post-PPS time.

[b] The additional direct costs are calculated as follows. Fifty patients: instrument development, $50,000; sampling, $10,000; computer costs, $48,000; staff, $141,120; report production, $100,000; total, $349,120. One hundred and seventy patients: instrument development, $50,000; sampling, $10,000; computer costs, $96,000; staff, $141,120; report production, $100,000; total $397,120.

The third design component (C) represents an augmentation of the number of observations per hospital. Adding a second pre-PPS observation to each hospital in the basic design provides a means of assessing the stability of the other pre-PPS observations. It also provides evidence about the pre-PPS trend, and in the event that a statistical adjustment is necessary due to nonequivalence, the double pretest can be used to assess the adequacy of the statistical adjustment. Of course, additional post-PPS observations could be added to the design and the costs would be the same as an additional pre-observation. As above, depending on the cost of the abstracting process, each additional set of observations is estimated to cost between $0.1 and $1.4 million.

## Likely Range of Costs

Assuming that this type of study is funded, it seems logical to collect data on a reasonably extensive set of outcomes including patient condition and subsequent use of post-hospital care. In this case, the estimates based on $50 per patient should be used. In addition, we believe that 50 patients per observation is sufficient for most of the questions. As such, the total costs (including administrative and analysis costs) for the basic design are estimated to be about $1.9 million. In addition, we believe that the basic design should be augmented to include an estimate of the anticipatory effects as well as a second pretest for the second replication of the basic design. This would add approximately $1.2 million for a total direct cost of approximately $3.1 million. If the work were to be contracted, indirect and administrative costs would need to be considered.

# Congressionally-Mandated PPS Reports, Experiments and Demonstration Projects

## A. Social Security Act Amendments of 1983

1. A report on methods and proposed legislation by which capital-related costs, such as return on net equity, can be included in the DRG prospective rates.

2. Annual reports (1984 to 1987) on the impact of prospective payment on classes of beneficiaries, hospitals, and payers, and other providers and, in particular, on the impact of computing DRG prospective payment rates by census division, rather than exclusively on a national basis.

3. A report on the feasibility of making payments for physician charges for inpatient services through the DRG payment system rather than on the current fee for service basis.

4. As part of the 1985 annual report to Congress, results from studies on:

a) the feasibility and impact of eliminating or phasing out separate urban and rural DRG rates;

b) whether, and by what methods, hospitals not currently paid under the DRG prospective payment system could be brought under the system;

c) the appropriateness of the outlier payment methodology, and the advisability and feasibility of modifications based on severity of illness, intensity of care, or other methodologies;

d) the feasibility and desireability of applying the DRG system to all payers;

e) the impact of DRG payment on hospital admissions and the feasibility of making a volume adjustment or requiring preadmission certification to minimize the incentive to increase admissions.

f) consideration of issues of cost-shifting to insurance payers.

5. As part of the 1986 annual report, the results of a study examining the overall impact of state alternatives to PPS on Medicare, Medicaid, private health expenditures, and tax expenditures.

6. A study making legislative recommendations with respect to establishing an equitable method of reimbursing sole community providers.

7. A study of ways to coordinate information transfer between Medicare part A and part B, particularly in cases where denial of coverage is made under part A and no adjustment of part B physician reimbursements is made.

8. A report on the appropriate treatment of uncompensated care costs and adjustments that might be appropriate for large teaching hospitals located in rural areas.

9. A report on the advisability of having hospitals make available information on the cost of care to patients financed by private and public payers.

10. A study and recommendations on a method to include hospitals located outside of the fifty states and the District of Columbia under a prospective payment system.

11. An evaluation of long-term care demonstration project by the On Lok Senior Health Services project in California.

12. A study of demonstrations with hospitals in areas with critical shortages of skilled nursing facilities to determine the feasibility of providing alternative systems of care or methods of payment.

13. A study on:

a) the effect that TEFRA limits on reimbursement for hospital back-up patients would have on hospital-based SNFs and;

b) the impact on SNFs of the DRG prospective payment system and recommendations concerning SNF reimbursement.

## B. Deficit Reduction Act, 1984

1. A report of the proposals developed for prospective reimbursement of skilled nursing facilities.

2. A study and report to Congress on proposed criteria under which modifications to adjustments for certain hospitals' payments would be made to take into account a difference in payment amounts in that current fiscal year to the hospital that results from wage adjustments which do not reflect area labor market costs.

3. A report on the range of options for prospective payment of SNFs, taking into account case-mix differences among the SNFs. A feasibility analysis of permitting inclusions of payments to hospital-based facilities within the DRG system.

4. A report to define and identify those hospitals that serve significantly disproportionate numbers of patients who have low income or are entitled to benefits under Part A.

5. A study of the advisability and feasibility of varying by DRGs the proportions of the labor and nonlabor components of the Federal payment amount instead of applying the average proportion of those components to all DRGs.

6. The Prospective Payment Commission shall review and report regarding the appropriateness of the payment and amounts provided for inpatient hospital services associated with implements or replacement of pacemaker devices or pacemaker leads.

7. A review of the appropriateness of the amounts recognized as reasonable for physicians and services associated with implantation or replacement of pacemaker devices and pacemaker leads.

8. A study of and report on modifications to conform the closure and conversion program authorized to PPS so as to provide assistance to hospitals which have particular problems in converting facilities from acute to less intensive care or in closing facilities.

9. A study of possible methods of reimbursement which would not discourage the use of certified registered nurse anesthetists by hospitals.

10. A study of further refinements which may be appropriate in the hospital prospective payments provision in order to address the problems of differences in payment amounts to specific hospitals.

11. A study of physicians reimbursement under the Medicare program and report to Congress to be conducted by the Office of Technology Assessment. It shall include specific findings and recommendations on methods by which payment amounts and other program policies under Part B may be modified:

a. to eliminate inequities in the relative amounts paid to physicians by type of service, locality, and specialty, with particular attention to any inequities between cognitive services and medical procedures; and

b. to increase incentives for physicians and other suppliers under such part to accept assignment for services.

12. A study to develop an appropriate index for purposes of adjusting payment amounts to reflect area differences in average hospital wage levels, taking into account wage differences of full-time and part-time workers.

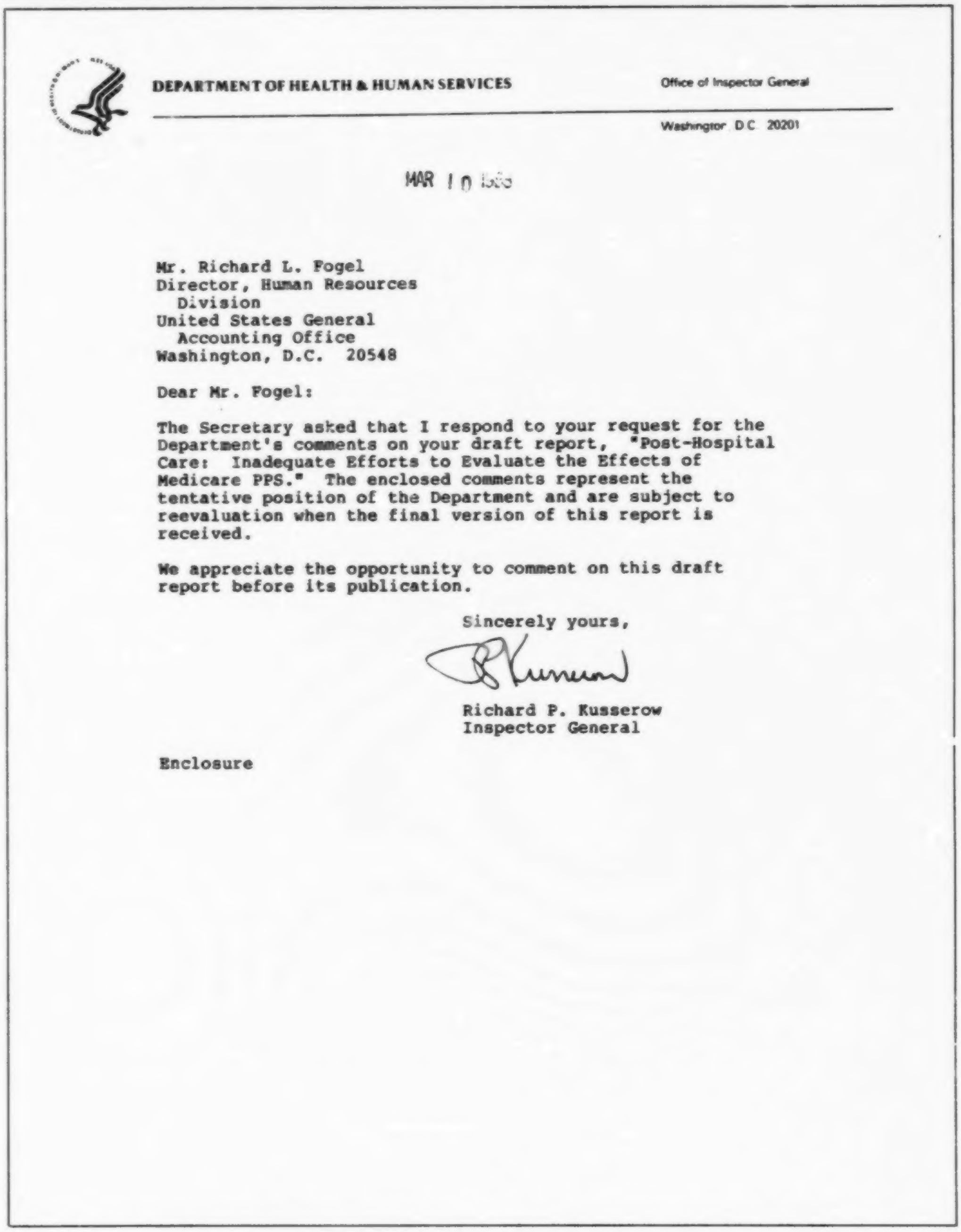
## C. Requests in the House Committee Report Accompanying the HHS Appropriations Bill (1985)

1. A study of the effects of PPS on clinical trials inclusive of correctional measures.

2. A study of the impact of PPS on the blood banking industry, including the demand for blood products, capital acquisition by blood centers and training of personnel in the blood banking industry.

3. A study of the effects of PPS on the U. S. health care system by the Prospective Payment Commission.

# Advance Comments From the Department of Health and Human Services



DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of Inspector General

Washington D.C. 20201

MAR 10 1986

Mr. Richard L. Fogel
Director, Human Resources
Division
United States General
Accounting Office
Washington, D.C. 20548

Dear Mr. Fogel:

The Secretary asked that I respond to your request for the Department's comments on your draft report, "Post-Hospital Care: Inadequate Efforts to Evaluate the Effects of Medicare PPS." The enclosed comments represent the tentative position of the Department and are subject to reevaluation when the final version of this report is received.

We appreciate the opportunity to comment on this draft report before its publication.

Sincerely yours,

Richard P. Kusserow
Inspector General

Enclosure

## Comments of the Department of Health and Human Services on the General Accounting Office Draft Report, "Post-Hospital Care: Inadequate Efforts to Evaluate the Effects of Medicare PPS"

### Overview

GAO's report, at the request of the Senate Special Committee on Aging, presents an evaluation plan that could be used to determine the effects of the Medicare Prospective Payment System (PPS) on post-hospital services and examines the adequacy of the efforts of the Department of Health and Human Services (HHS) to develop this information. GAO has categorized its evaluation questions about the effects of PPS into five general areas: (1) patient condition at hospital discharge; (2) the use of post-hospital sub-acute services; (3) expenditures for those services; (4) access to those services; and (5) the quality of care delivered in those services.

To answer these questions, GAO presents a two-part plan which draws on two distinct design strategies. First, GAO believes data available in the Medicare Statistical System are sufficient for causal analyses using an interrupted time series design which would determine whether changes in the use of and expenditures for Medicare-covered post-hospital services as well as readmissions and mortality are due to PPS. Second, a design termed the retrospective nonequivalent control group design could be used to produce information on the effect of PPS on patients' condition at the time of hospital discharge and better information on the quality of post-hospital care than could be obtained from Medicare data alone on readmissions and mortality.

Based on GAO's examination of the ongoing and planned PPS research at HHS, GAO believes HHS's analyses will not determine whether observed changes in any of the five general areas were caused by PPS. As a result, GAO reports that HHS will not have an adequate basis for concluding whether PPS does or does not affect post-hospital care.

### GAO Recommendation

That the Secretary of HHS direct the Administrator, Health Care Financing Administration (HCFA), to undertake interrupted time series studies using data available from the Medicare Statistical System to determine some of the effects of PPS on post-hospital care. In particular, information should be developed about the effects of Medicare PPS on the use of and expenditures for post-hospital skilled nursing home and home health care services, and on readmissions to Medicare-covered facilities and mortality rates for episodes of illness beginning with a hospitalization.

### Department Comment

We view the evaluation of PPS as a complex, multidimensional undertaking. In developing our research agenda, we have attempted to define the universe of economic, access, and quality issues relating to PPS, and their implications for beneficiaries, hospitals and other providers of care, and other payors for inpatient hospital services. Attachment 1 contains a matrix summarizing the range of evaluation issues HCFA presented in its first annual PPS report to Congress. Based on this framework, specific projects are designed and implemented on an ongoing and evolutionary basis.

In contrast to HCFA's overall agenda, this GAO draft report deals in considerable detail with only one subset of issues, i.e., PPS effects on post-hospital, sub-acute services. Although we clearly agree that these issues are of major importance, GAO does not place these issues into the context of the broader set of evaluation concerns —such as those included in HCFA's study matrix. For example, the report does not recognize the importance of examining the ramifications PPS may have on in-hospital medical treatment and their implications for analyzing and monitoring the quality of care, as is currently being examined through two Rand projects supported by HCFA.

Consequently, in the GAO analysis, this work and other important projects currently in HCFA have been critiqued primarily for their ability to contribute to knowledge about changes in access, use and costs of post-hospital utilization, and whether observed changes can be attributed to PPS. Since the studies in the HCFA research agenda were designed to meet a broad array of public policy concerns (including whether or not inpatient hospital treatment patterns have changed under PPS), many of our studies will not meet the sole GAO criterion of understanding post-discharge use.

We believe that GAO should revise the report by specifically adding a background chapter which provides a broader context to its study and that explains the reason for selecting this sole issue as the major focus of its report (i.e., post-hospital care). Additionally, GAO's analysis should explain that HCFA's current and planned research responds to a much wider range of issues than those contained in GAO's current draft report. Moreover, the GAO report should be updated to include HCFA's study on aftercare as discussed below. Without these changes, the current report tends to obscure the potential value of our overall research agenda.

To study post-hospital aftercare, the GAO report proposes a basic methodology, using interrupted time series studies, for determining the effects of PPS on post-hospital discharge outcomes. These include changes in utilization of skilled nursing facilities (SNF) and home health agency services, as well as hospital readmissions and mortality. As mentioned in the "Overview" section of these comments, the report references five evaluation areas relating to Medicare covered services: (1) patient condition at hospital discharge, (2) the use of post-hospital sub-acute services; (3) expenditures for those services; (4) access to those services; and (5) the quality of care delivered in those services.

In addition to our concern about the limited perspective of the GAO report and the manner in which GAO critiques HCFA-supported research, it is important to note that each of the five issues raised by GAO is being addressed in a pilot study currently underway to develop methods for assessing the need and availability of hospital aftercare. Because of the importance of these issues to us, HCFA and the Office of the Assistant Secretary for Planning and Evaluation (ASPE) are working cooperatively in the design and conduct of this study. In addition to examining Medicare covered services, the aftercare study also evaluates access, use, and costs of noncovered post-hospital care, as explained below. We are optimistic that this state-of-the-art work will allow us to advance and expand our efforts in this area even further.

## Analysis of Hospital Aftercare Under PPS

This pilot study represents a major project which was begun as part of the fiscal year (FY) 1986 PPS evaluation planning process. Since it was not part of our FY 1985 PPS evaluation project plan, GAO may not have had any knowledge of it at the time the subject report was drafted. This project, formally entitled "Analysis of Hospital Aftercare Under PPS," has the following objectives: First, the project will develop a reliable methodology for assessing: (a) patients' functional ability and dependence at discharge; and (b) patients' usage of immediate post-discharge services. Second, the project will link functional ability at discharge to data describing aftercare as a means of assessing access and appropriateness of post-discharge (aftercare) services. In the longer-run, these data will be linked to Medicare utilization and enrollment files to permit analyses pertinent to the five issues raised by GAO. Finally, a series of case studies will be conducted on a subsample of surveyed individuals to collect additional information on the experience of Medicare beneficiaries.

### 1. Patient Condition at Discharge

Patients' condition at discharge will be determined by a specially designed instrument which will be used to extract selected information from the medical record. These data will be used in determining levels of physical and mental disability and dependency (using accepted scales for measuring functional levels) and in determining patients' needs for aftercare services. In this way, we will be able to track specific subpopulations at risk at the time of discharge, such as individuals prematurely discharged from hospitals and individuals with underlying chronic conditions or functional disabilities. This instrument will be based upon work currently being done under a cooperative agreement with the Northwest Oregon Health System Agency, as referenced in the GAO report.

### 2. The Use of Post-Hospital Sub-acute Services

As already noted, the aftercare study will develop a method for assessing the availability, appropriateness and use of sub-acute services combining data from a sample survey of patients' use of aftercare services with Medicare patient record data. The patient survey will collect information pertaining to both formal services (such as SNF services) and informal patient care support, as might be available from the patient's family. Other outcomes, including hospital readmissions and mortality, will be analyzed through linking hospital discharge and aftercare records with utilization and enrollment data available from the Medicare Statistical System.

### 3. Expenditures for Post-Hospital Sub-acute Services

Post-hospital expenditures will be analyzed as part of the linked data base described above. Additionally, information on patients' out-of-pocket expenditures and non-Medicare payment sources will be gathered in the patient survey.

### 4. Access to Post-Hospital Sub-acute Services

Access to post-hospital sub-acute services will be specifically addressed as part of the aftercare patient survey. These findings will be linked with Medicare administrative records to uncover the relationship between Medicare beneficiaries' perceptions about access problems and documented use of sub-acute facilities.

### 5. Quality of Care Delivered in Sub-acute Services

Inferences relating to quality of sub-acute care will be assessed primarily through an analysis of time series data on changes in mortality patterns, as well as through data gathered in the aftercare survey and follow-up case studies.

In summary, we feel that it is significant to note that the approach recommended by GAO focuses on only one component of post-discharge aftercare; i.e., post hospital use of formalized sub-acute services, such as SNFs and home health agencies. Noncovered and informal aspects of post-discharge care that will be obtained through the patient survey (such as patients' living arrangements and community support services) were not addressed.

We feel that the viability of PPS depends, in part, upon proper discharge planning and access to a comprehensive range of services and thus it is vital that an aftercare study address this issue.

In addition to the concerns already discussed, we feel that GAO's descriptions of relevant studies currently underway within HCFA, particularly that subset of studies related to the quality of care, should be rewritten to depict a clearer understanding of their intent. Attachment 2 provides suggested language describing these studies for inclusion in the final report.

Additionally, GAO should be aware that HCFA is conducting an ongoing set of sophisticated studies using various multivariate methods (such as canonical correlation analysis) as a means of monitoring hospitals' quality of care. One aspect of those studies will be undertaken by the Peer Review Organizations in the upcoming contract cycle and will result in a series of pilot projects to evaluate the feasibility of acquisition of more detailed data on patient characteristics and on the process of care from the medical record to be linked to longitudinal HCFA data on outcomes.

## Attribution

The final concerns we wish to raise about the GAO draft report relate to the concept of "attribution" and "attributive" studies. The GAO stresses the need for attributional studies based on careful evaluation of pre- and post-PPS data and recommends an "interrupted time series" methodology as an approach to determining PPS effects on post-hospital discharge outcomes.

We believe that the concept of attribution is a difficult and subjective one to interpret when applied to observational, statistical studies such as those involving PPS effects on post-discharge utilization of services.

In its strict sense, the term "attribution" is normally used to refer to research studies conducted under controlled laboratory conditions capable of discerning cause and effect relationships. Unlike controlled laboratory experiments, observational, statistical studies, such as the type recommended in the GAO report, are not typically characterized as attributive because they do not precisely control for confounding (e.g., non-PPS) factors in determining cause and effect.

Observational studies, we feel, vary in their attributive reliability, depending on the complexity of the problem being addressed and the sophistication of the statistical modeling techniques used. Observational studies must, therefore, be evaluated individually in determining how well they explain cause and effect. GAO's report does not appear to consider these complexities.

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Notwithstanding the issue of the feasibility of conducting sound attributional studies, there are trade-offs between studying a narrow range of issues for which pre-PPS baseline data exist against studying a broader range of relevant issues, even though pre-PPS data does not exist. In this case, for an understanding of access, quality and cost issues relating to post-hospital services, we believe it is necessary to undertake a comprehensive study of both formal and informal aftercare services, even though comparable pre-PPS data will not be available for the range of informal services beneficiaries need and use after hospital care.

GAO Recommendation

That the Secretary of HHS direct the Administrator, HCFA, to expedite the completion of the Medicare Automated Data Retrieval System (MADRS) that will reorganize the Medicare administrative data into a data file which is better able to support research and evaluation activities than are the current files.

Department Comment

With the assistance of a contractor, we are making progress on this project. However, because of the complexities and many aspects involved in evaluating PPS, MADRS cannot be the only vehicle used in resolving the data and research issues relating to the evaluation of PPS. We are working to ensure that appropriate data resources are identified and used.

Appendix VIII

# Glossary

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| Acute Care | Care provided for acute illness, that is, illness of a severe nature and relatively short duration (normally defined as less than 30 days), and from which the patient can be expected to return to his or her state and level of normal activity. For the purposes of this report, acute care is the level of care required for the appropriate medical treatment of persons in acute care, short-term hospitals. |
| Case Mix | The relative frequency of admissions of various types of patients, reflecting different needs for facility resources. Patient case mix indices used in hospital, nursing home or home health settings have been based on a variety of factors, such as patients' diagnoses or the severity of their illnesses. |
| Certificate of Need | A certificate of approval issued by health planning agencies to health care facilities proposing to construct or significantly modify health care facilities, incur large capital expenditures, or offer new services. Failure to obtain such certification could result in ineligibility for a state license. |
| Construct | An attribute, usually unobservable, that is represented by an observable measure. The construct of "quality of care" for example, may include measures of the use of services, intensity of services used, and measures of outcomes such as recovery rates or complications. |
| Construct Validity | The extent to which a measurement accurately represents the construct it purports to measure and produces an observation distinct from that produced by a measure of another construct. |
| Copayment | A form of beneficiary cost-sharing whereby the insured person pays a specific amount when using a specific health service. Under Medicare in 1985, for example, beneficiaries were charged a copayment of $50 per day after the first 20 days for skilled nursing facility care. |
| Deductible | A form of beneficiary cost-sharing whereby the insured incurs an initial expense of a specified amount within a given period of time before the insurer assumes liability for additional costs of covered services. In 1985, Medicare beneficiaries were subject to a deductible of $400 for |

inpatient hospital care; there was no deductible charge for Medicare-covered skilled nursing facility or home health care services.

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| Diagnosis Related Groups (DRGs) | Groupings of diagnostic categories drawn from the International Classification of diseases and modified by the presence or absence of significant comorbidities or complications, and other relevant criteria (e.g., old age). Payment rates to hospitals are established for each DRG under the Medicare prospective payment system enacted in the Social Security Act Amendments of 1983 (Public Law 98-21). |
| Discharge Abstract | A shortened version of a patient's medical record including items abstracted from medical records. Discharge abstracts usually include information such as patient identification, date of birth, sex, race, enthnicity, residence, hospital identification, admission and discharge dates, identifiers for admission and operating physician(s), principal diagnosis, procedures and dates performed, disposition of patient, and expected sources of payment. |
| External Validity | The extent to which a finding applies (or can be generalized) to persons, objects, settings, or times other than those which were the subject of the study. |
| Generalizability | Used interchangeably with "external validity." |
| Intermediate Care Facility (ICF) | A licensed health care facility which provides ongoing health care and services to individuals who require such care in an institutional setting, but who do not require the level of care or treatment that a skilled nursing facility is designed to provide. |
| Internal Validity | The extent to which the causes of an effect are established by an inquiry. |
| Length of Stay | The number of days a patient stays in the hospital or nursing home from admission to discharge. |

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| Long-Term Care | Health care or related personal care services provided on a sustained basis to individuals whose functional capacities are chronically impaired. The range of services covers a continuum of care provided in home or institutional settings, including personal care assistance, adult day care and foster care, and skilled nursing care provided by home health agencies and in nursing homes. |
| Measurement | A procedure for assigning a number to an object or an event. |
| Medicare | A nationwide, federally administered health insurance program covering (in part or in full) the cost of hospitalization, medical care and some related services for most persons aged 65 and older, persons receiving Social Security Disability Insurance payments for two years, and persons with end-stage renal disease. Medicare consists of two parts, part A (Hospital Insurance) and part B (Supplementary Medical Insurance). |
| Medicaid | A federal/state program operated and administered individually by each participating state that pays for a variety of medical services for certain low-income persons. |
| Outliers | With respect to prospective payment for health care, cases with unusually high or low resource use. Under the Social Security Act Amendments of 1983 (Public Law 98-21) outliers are cases which exceed the average length of stay for cases of a given group by a fixed number of days or standard deviations (determined by the Secretary of HHS) whichever is smaller ("day outliers"); or which exceed the charges (adjusted to cost) for a given group by a fixed multiple of the applicable DRG rate or a given fixed dollar amount (determined by the Secretary of HHS), whichever is greater ("cost outliers"). Medicare does not consider cases with unusually low resource use as outliers. |
| Part A (Medicare) | Medicare's Hospital Insurance program, which covers specified hospital inpatient services, post-hospital extended care, e.g., skilled nursing, home health and hospice services. Part A is an entitlement program, and is available without payment of a premium, those not entitled may |

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| | enroll in the program by paying a monthly premium. Beneficiaries pay deductibles and/or copayments for some covered services. |
| Part B (Medicare) | Medicare's Supplementary Medical Insurance program which covers physician services, hospital outpatient services, outpatient physical therapy and speech pathology services, and various other ambulatory medical services and supplies. This program also covers home health services for Medicare beneficiaries who have part B coverage only. Enrollment in Part B is optional and requires payment of a monthly premium. Beneficiaries are responsible for a deductible and coinsurance payment for most covered services. |
| Prospective Payment | A method of payment for health care services in which the amount of payment for services is set prior to the delivery of those services and the provider is at least partially at risk for losses or stands to gain from surpluses that accrue in the payment period. Prospective payment rates may be per service, per capita, per diem, or per case rates (DRGs represent a per-case prospective payment approach). |
| Prospective Payment Assessment Commission (ProPAC) | An independent commission established by the Social Security Act Amendments of 1983 (Public Law 98-21) to advise the Secretary of the Department of Health and Human Services on annual updating and adjustments to the DRG prospective payment system. |
| Reliability | The extent to which a measurement can be expected to produce similar results on repeated observations of the same condition or event. |
| Sensitivity | With respect to measurement, the responsiveness of a measure to a change or difference in the construct it represents. |
| Skilled Nursing Facility (SNF) | An institution (or distinct part of an institution) that provides skilled nursing care and related services to patients who require medical or nursing care. It may also provide rehabilitation services to injured, disabled or sick persons. An SNF must provide 24 hour nursing services, and employ at least one full-time registered nurse. |

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| Subacute Care | As used in this report, medical and health care required for persons recovering from acute care episodes which is less intensive than the level of care provided in acute care hospitals. Subacute care includes skilled nursing care provided in skilled nursing facilities, home health care, and hospice care covered by Medicare, as well as other health care services provided nursing homes, other long-term care facilities, and patients' homes. |
| Utilization and Quality Control Peer Review Organizations (PROs) | Medicare contractors, usually organizations of physicians, responsible for reviewing the appropriateness and quality of inpatient hospital care. PROs were established by the Tax Equity and Fiscal Responsibility Act of 1982 (Public Law 97-248) to replace Professional Standards Review Organizations (PSROs). Hospitals are required by the Social Security Act Amendments of 1983 (Public Law 98-21) to have agreements with PROs to review quality of care and appropriateness of admissions and readmissions for Medicare patients. |

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